The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879

CLINTON S. DARLING, Editor
CHARLES A. BRESKIN, Adv. Mgr.
E. M. GIBSON, Asst. Mgr.
JOSEPH K. COSTELLO, Central Rep.
N. C. ROCKWOOD, Advisory Editor
H. E. HOPKINS, Associate Editor
ALLAN B. SANGER, Eastern Rep.
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W. D. CALLENDER, President
N. C. ROCKWOOD, Vice-President
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C. O. NELSON, Secretary

Volume 25 September 9, 1922 Number 18

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Coming to Headquarters

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Not one, but a dozen inquiries are constantly passing over the desks of ROCK PRODUCTS' staff and getting the attention of these trained and experienced observers.

It is interesting to note that these inquiries come not alone from American, Canadian, and Mexican sources, but frequently requests come from England, France, Japan, Australia, and other far-away countries from producers who regard ROCK PRODUCTS as headquarters for all such information and assistance.

* * *

Sand-Lime Brick for Holland

Typical of the requests referred to above is the following received during the past week from Holland, which was referred to seaport makers of sand-lime brick:

"As we have a great order of sand-lime brick on hand for one of the Netherlands settlements, it is perhaps to prefer to buy the bricks in New York, Brooklyn, Boston or Baltimore or elsewhere, because the freight from the U. S. A. will not be so high as from Holland.

"We shall, therefore, be glad if you will let us have by return of post the price per 1000 brick f.o.b. plant or nearest shipping point in these towns."

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Lime for Chemical Uses

Realizing the growing importance of lime in the chemical industries, ROCK PRODUCTS has given special prominence, at this time of the Eighth National Exposition of Chemical Industries, to this subject in this issue. Glance at the titles at the left of articles in this issue. No lime maker can afford not to keep this valuable issue of ROCK PRODUCTS on file. A little later copies of this issue may not be available.

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Must Have Rock Products in India

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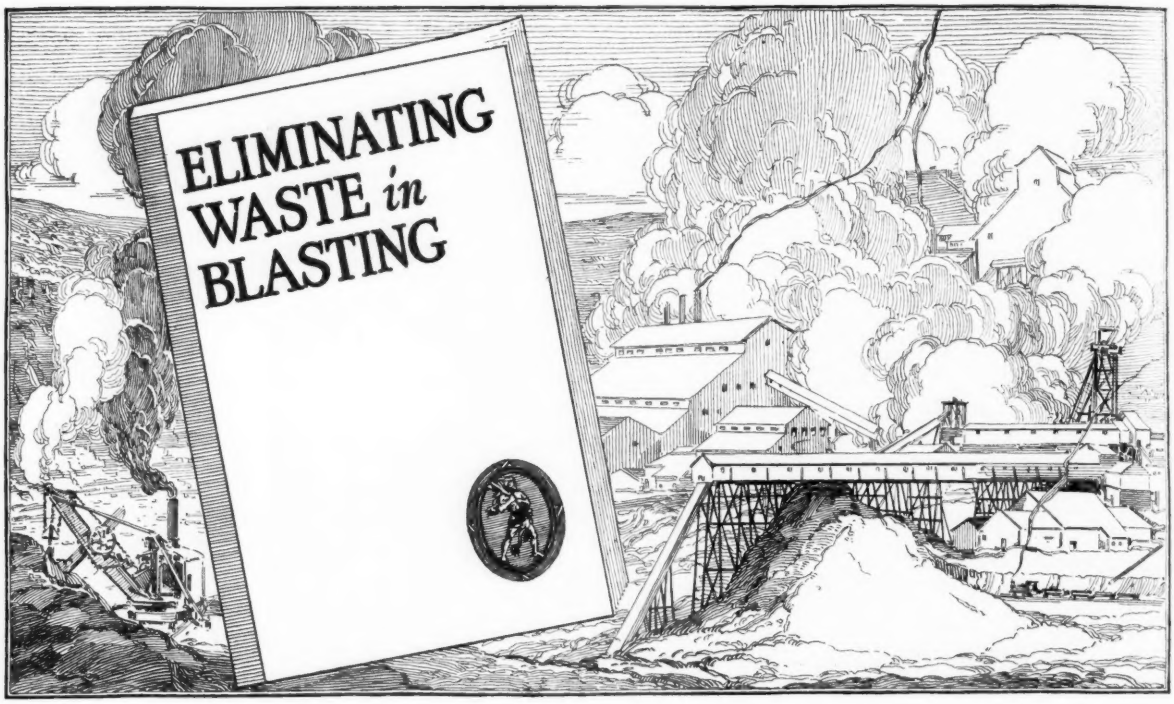

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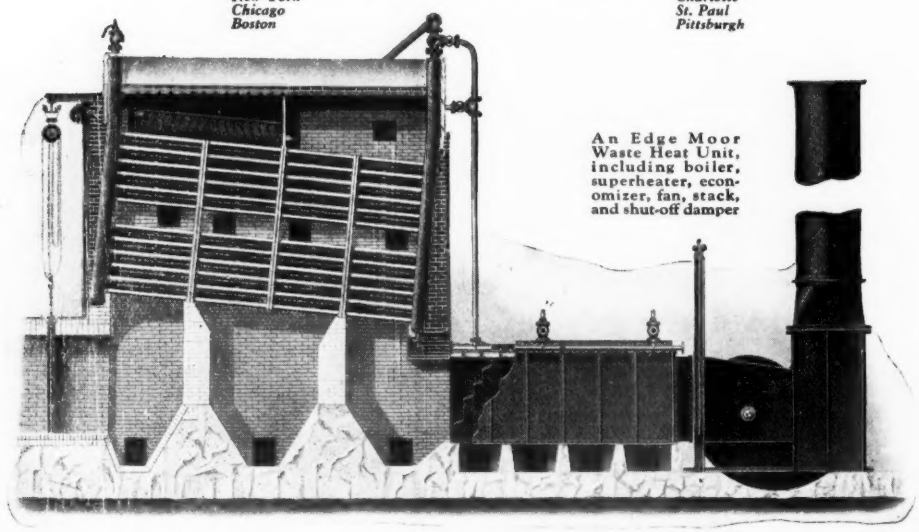

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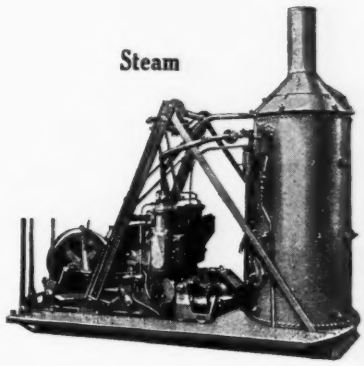
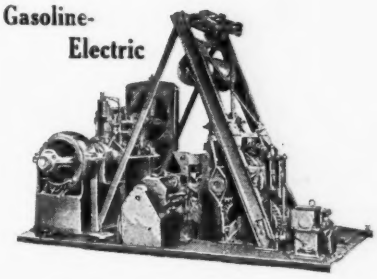


Gasoline-Electric



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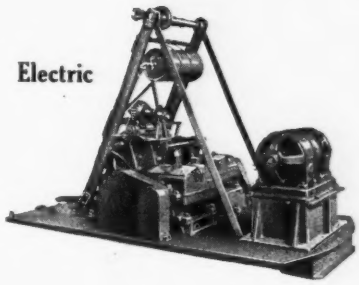

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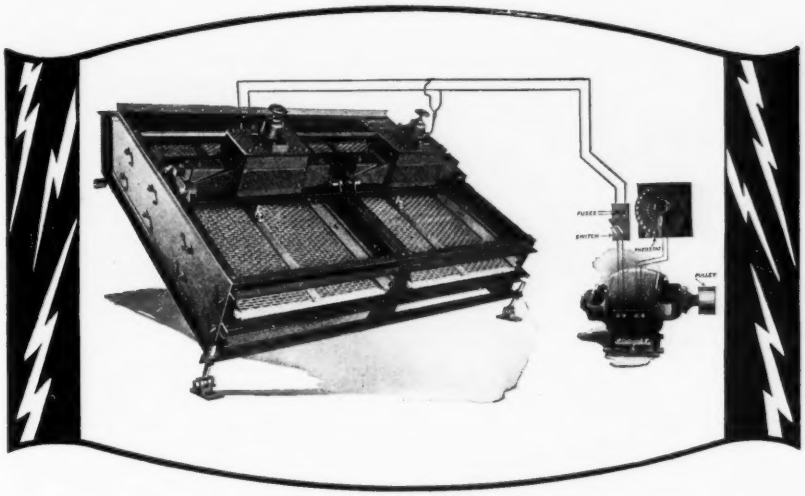

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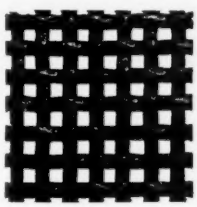
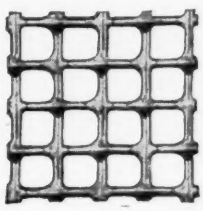
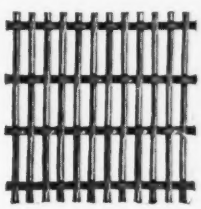
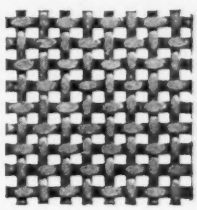



Rock Products

Volume XXV | Chicago, September 9, 1922 | Number 18

Growth of the Use of Lime in the Chemical Industries

While the curves of lime production for building and agricultural uses have shown a general downward tendency during 15 years, chemical lime production has steadily increased, and this field now constitutes the main outlet for the product of the lime industry

By Dr. M. E. Holmes

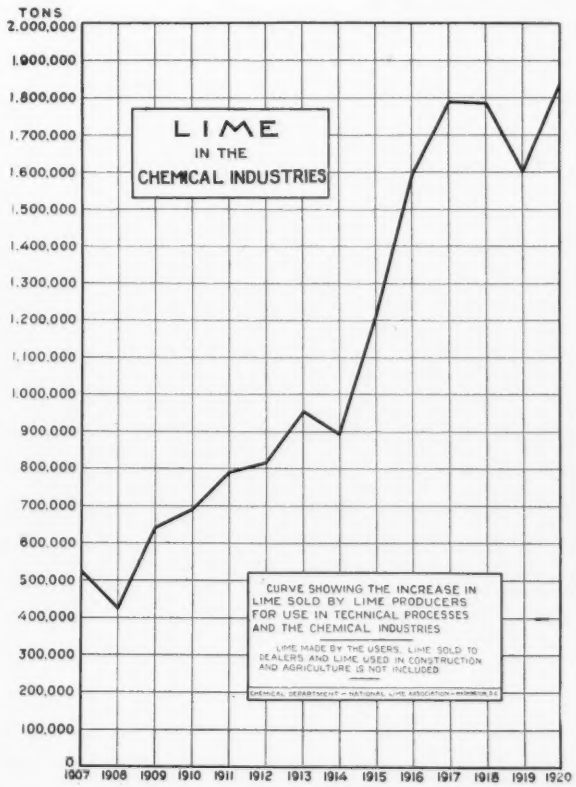
Manager of the Chemical Department, National Lime Association

IT IS a matter of great importance not only to the technical user of lime but also to the lime manufacturer to fully realize that the use of lime in the technical industries has of late years been growing by such leaps and bounds that it is now a material of first-rate importance in those industries and constitutes the main outlet for the product of the lime industry.

The curve showing the increase in lime by lime producers for use in technical processes and chemical industries is based upon data obtained by the United States Geological Survey. It does not represent the total lime used in this class of industries, but does represent lime made by a large group of lime producers and moved to another point for use. The enormous amount of lime used in making alkalis is not included, it being produced as an integral part of the manufacturing process.

Although the curve, therefore, does not represent the total lime used, the figures for each year represent the increasing output for chemical uses of a certain large group of producers. This curve therefore should give a good indication of the growing use of the lime for chemical purposes by the technical industries all over the country.

These chemical uses include a large number, some of the more important of which are water softening and filtration, sulphite soda and sulphate paper pulp manufacture, the manufacture of glass, leather, carbide, dead burned dolomite, silica, brick, textiles, varnish, cold-water paints and whitewash and many others which are similar in that they involve the principles of chemical engineering in their operation.



As recently as 1908 the chemical uses of lime were relatively unimportant. Only 12 years later this condition was completely reversed with chemical uses far ahead of the other uses. The remarkable growth in this use of lime is of great significance to the chemical manufacturer and technical user of lime because it indicates that these industries are finding out more and more how to make use of this cheapest of all chemicals, thereby reducing their expenditure for raw materials and manufacturing processes. It is of the utmost importance also to the lime manufacturer because it indicates where his markets of the future will probably develop and what the requirements of this market will be.

The chemical market for lime requires a much broader application of technology than do the agricultural and construction uses. Not only are the physical properties of the lime important, as in the latter uses, but there are exacting requirements in chemical properties and uniformity. That the industry has not failed in these obligations is indicated by the trend of the curve.

The trend of the curve indicates that there is a fertile field

of business ahead of the manufacturer in the chemical field and, by the same token, a fertile field of profit ahead for the lime user. It should be a source of mutual benefit for the chemical user and producer of lime to get together and solve the problem of a better use of lime.

The National Lime Association is prepared to co operate with and serve both the producers and users of lime in many ways and the association welcomes the opportunity to do so.

Some Needs of Lime Manufacturers

By M. E. Squire
Manager, Allwood Lime Co.

THERE has lately been issued by the National Lime Association, an outline map showing different uses for lime.

The need of a lime manufacturer who receives this outline is information that will tell him the grade of stone, and the kind of lime that are best suited to each one of these different uses. Hence, what every lime manufacturer needs to know, and what only a geological chemist can supply to him is the exact nature of the stone in his quarry, whether dolomitic, calcium, high calcium or high magnesian, the approximate number of grades of stone, and the broad difference in the chemical content and geological character of the more marked grades of stone that is in the mine.

What We Need to Know

He needs to know, by a common and appropriate name, the highest grade of stone for any purpose in his quarry, its chemical content, geological character, and its known specific use. Also the same information regarding his average and lowest grade stones, and if this latter stone be classified as a waste, so far as building or chemical lime are concerned, then he should be told whether any byproduct might be salvaged, and if so, what it is.

The Manufacturer's Needs

A manufacturer needs to know what kind of fuel is best adapted, not to his type of kiln or the locality in which he is doing business, but to the kind of lime he is going to produce, especially with the chemical limes, some of which must be burned (as is the Allwood milk of magnesia lime for neutralizing lactic acid) with certain kinds of wood only.

Where an operating plant originally started business with a stone that at the time was satisfactory for the use to which it was being put, but since has run out and a lower grade developed that threatens injury to the business, a geological-chemist should be available, a man of practical experience with the ability to solve this problem and prevent the loss of the investment, by furnishing information as to a new use. Or, if that is not possible, this practical engineer should devise the best way to salvage what is still on hand in the way of equipment. If this man came from an authorized association whose interest it was to keep all lime plants alive and producing profitably, what a saving of otherwise wasted energy, time, material and money would result!

One More Need

There is one more need of the lime manufacturer. This is not chemical knowledge, but the need for a reliable, disinterested "some place" or association, let us call it a "bureau of common sense," where a manufacturer can obtain reliable information as to whether he is in a competing area for any specific lime, or so far away from the market that the distance his product must be hauled dooms the venture to failure from its start.

THE Allwood Lime Co., with quarry and kilns at Manitowoc, Wis., are "the first and only company in the West to aid our patrons by chemical analysis and research to ascertain exactly what purpose our lime is best suited for." Some of the needs expressed by Miss Squire in the accompanying article "have been solved through considerable effort and expense and years of time," according to the author, but "if they could be supplied from a central bureau authoritatively it would be a great advantage."

The only results of his efforts in such cases are an unnecessary interference with and a general upsetting of his competitor's business. In other words, a place is needed where the intending manufacturer can honestly find out if there be any need for his plant and its products at all, or if the demand is already over-supplied.

A limestone deposit in private hands still remains a natural resource and belongs to the future as well as the present generation. It is a waste and a crime to burn up stones and plaster houses with a lime that is inferior in quality for that purpose, or with one that might be valuable and rare for an entirely different economic use.

The writer has in mind an incident that occurred during the great war. Meeting with the government chemist concerning the manufacture of nitrogen from the air, this professor eagerly questioned me as soon as we met as follows: "I know we are to talk about the nitrogen proposition, but first tell me, have you any rock aluminum in your mine. We need it badly for ribs for our aeroplanes. We find it very scarce."

I had to reply that the Allwood quarries had only a very small deposit occurring in pockets, that the highest amount so far found was only about 1¼ per cent aluminum, while in our high grade stones barely a trace was to be found.

Some 10 years before this time, however, there was a quarry a short distance from our plant that had a rich and large deposit of aluminum rock. A few of the spalls that were remaining when I visited the place in 1912 showed 14 to 18 per cent aluminum, though at the time of the professor's inquiry (1917) not even a spall was left. The stone had been burned for lime plaster, the spalls used for road material.

Thus a necessity that our country in her time of distress sorely needed had been squandered through ignorance of the chemistry of the stone.

The Vital Question

The vital question today is, shall we manufacturers be allowed to continue this waste, or shall there be intelligent supervision by our national lime association that will obviate these antiquated and ignorant methods?

Personally, I hope this can be brought about. It is not a case for a government commission of politicians appointed as a reward for political service to regulate, but for the capable men who know, whose knowledge can be made profitable to both themselves and those who require that knowledge, and whose interest it is to put the lime business on a fair and profitable scientific basis. And above all, will the fakirs and self-styled experts be eliminated from their parasitic positions, for they, by their inefficiency, when employed by the trusting

manufacturer, have created a doubt in the minds of many of us as to whether we can get men competent to solve these lime problems and supply these needs.

Before the chemist, then, and above all the geological chemist, lies this immense and largely unexplored field. There are 626 problems which await the solution of the master minds, and several times 626 manufacturers in the market to pay for the solutions when they are efficiently and honestly solved.

How Burning Conditions Affect Lime

Preliminary results of investigations by the author in the Division of Industrial Chemistry at Ohio State University are given in the following article

By James H. Withrow
Professor of Industrial Chemistry, Ohio State University,
and Consulting Chemical Engineer

IF ONE has not studied the matter, one naturally wonders what there could be that is not already known about either the properties or the burning of lime. Every one knows lime must have been intimately known for ages to innumerable people in the arts and sciences. A visit to Italy will disclose to the observant the lime-kilns of the Romans—mute monuments. Even these are probably quite recent in the history of lime burning. Then, too, lime as a chemical base is understood to have been familiar to the ancient alchemists. Certainly for nearly 200 years since the dawn of the true science of chemistry lime has been the cheapest and probably the most important chemical base in the study of chemistry and in the manufacture of chemicals.

Unexpected Gaps in Knowledge

Notwithstanding all this real experience and the hoary age of the industry, the rapid industrial development of modern times necessitates new and better information about the properties of lime and the influence of burning upon these properties. It is perhaps not so surprising, therefore, that our otherwise extensive knowledge of lime burning and the long study of lime by the science of chemistry still shows unexpected gaps; in fact, shows signs of really just beginning.

It must be admitted that we possess little or no correlation between the burning of lime and its physical and chemical properties. For instance, while much is known of the properties of lime, and much valuable experience has been accumulated in the burning of limestone, little or nothing has been done in the investigation and correlation of such things as the influence of time of burning on the properties of lime. Except in a few isolated cases, nothing has been done and recorded in this field and a systematic tying in of burning history to the properties of lime has never been completed. The nearest approach to it was the work of some little time ago by Bleininger and E. M. Rey, who varied only the temperature of their burns and did not vary the times.

Ohio University Plan

A vigorous effort at such a complete correlation is under way at the Ohio State University in its Division of Industrial Chemistry, with the help of graduate students in industrial chemistry and a fellowship from the National Lime Association. In fact, the project of correlating the physical and chemical properties of a lime with its burning history or the method, temperature and time of burning originated in the brain of Dr. M. E. Holmes, chemical director of the National Lime Association.

This investigation of lime burning is being conducted at the Ohio State University for the lime industry so that, if possible, a better lime will be produced for the various uses, and so that the kind of limestone may be determined which will give the specific properties demanded in such infinite variation in the industries.

When the study of the relation between lime burning and the properties of lime shall have progressed far enough we will be in possession of the best possible basis for adequately judging what limes will be most likely to meet new and special demands, also how we can best avoid the use of limes which can be predicted to be unsuitable for some new requirement. It is not unlikely also that a clearer light will thus be thrown upon some old troubles of the industry. It is also probable that this fundamental knowledge will tell us why certain limes are good for certain chemical purposes while others are not.

Further study may also improve those found not suitable for specific purposes. It is not expected that such a study will necessarily change modern lime-burning methods, though it may result in furnishing a scientific basis for opinions regarding operation methods arising from experience in lime burning.

The work at the Ohio State University has been under way about a year and the results are beginning to take preliminary tangible form. It would be premature to draw any but general and obvious conclusions at this time, for such conclusions would be subject to subsequent revision or reversal. Nevertheless, the general tendency of the results will be of interest and detailed conclusions can be given when they coincide with common experience and thus are to all appearances foregone conclusions.

The Demonstration to Date

In this work to date it appears to have been demonstrated that

(1) There is a temperature below which no loss in weight will occur, no matter how long the limestone is burned. This temperature is probably different for each limestone or change in chemical composition thereof. For instance, this temperature is lower for magnesium limestone than for high calcium limestone. Above this critical or dissociation temperature peculiar to each limestone, all heat furnished does work in reducing the weight of the limestone by driving off carbon dioxide gas and producing lime. Below this dissociation temperature, all heat furnished does no work and is wasting fuel if the dissociation temperature is not exceeded.

(2) There is a maximum loss in weight on burning limestone which cannot be exceeded, no matter how high the temperature of burning may be nor however long the temperature may be applied. This loss varies with the composition of the limestone. It is higher in high magnesium limestone.

(3) Loss in weight of any limestone upon burning, rate of burning, and early attainment of the finished stage are proportionately connected with both, or either, the temperature of burning and the length of time it is burned. Details and curves are being worked out in these investigations. When completed they will cover a wide variety of typical stones.

(4) The rate at which a limestone loses weight on burning at any given temperature is dependent upon the chemical composition

and the porosity of the original stone. The rate of burning is greater for stone high in magnesium.

(5) When a limestone is under-burned, one of two things may happen: (A) If the stone is a high magnesium limestone and the temperature is suitable, the magnesium carbonate alone may burn or decompose and the calcium carbonate remain unburned. (B) As the burning usually progresses from the outside of a given stone, inward, the outside layers may be completely burned while the inner core may be unburned, or partly burned; or the magnesium carbonate above may be burned or decomposed.

(6) The minimum burning or decomposing temperature of a limestone is materially affected by the concentration (analysis) of the gases which surround the stone while it is being burned.

The inevitable result of these investigations and other work conducted by the National Lime Association and others will be a better and a cheaper product.

The industry is certainly to be congratulated on the progressive way the constituent corporations are assisting and supporting these efforts and investigations for the improvement of the industry as a whole.

Using Lime for Treating Colloidal Color in Surface Waters

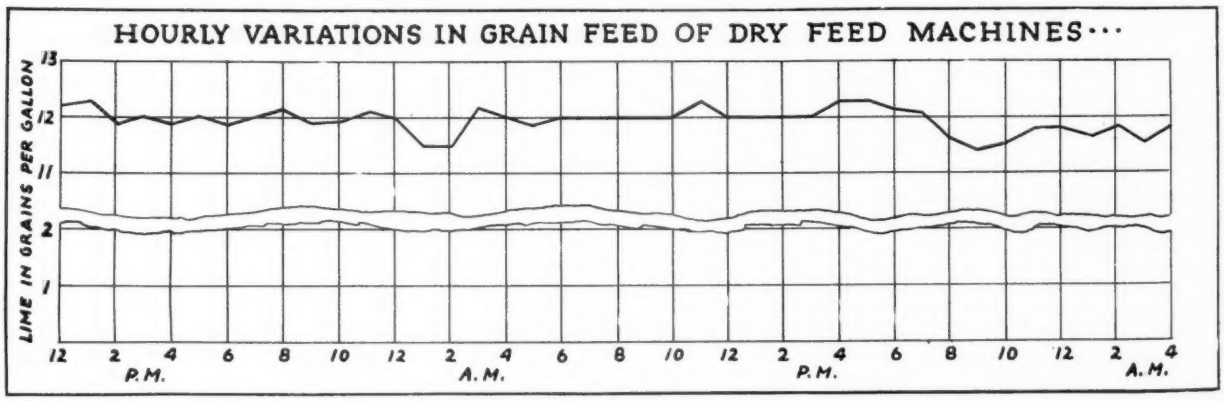
By R. S. Buzzell
Superintendent of Filtration, Flint, Mich.

WHERE previous to 1918 the color of the Flint river was seldom more than 40 to 50 parts per million, and then for short periods only, the color condition for the past few years has been a major problem in the treatment of the water supply at Flint, Mich. The color is extremely colloidal in character, and lasts over a period of several months of from 100 to 150 parts per million. As color of this character develops, the problem of coagulation previous to sand filtration is the main problem of chemical treatment, if the effluent of filters is to be reduced to a color acceptable to the consumer.

The color has shown a yearly increase since 1918. Previous to that year, from one to three grains of alum sulphate per gallon of water resulted in efficient coagulation of both color and turbidity, and it was seldom that the color of the filtered water was higher than 15 parts per million.

As compared to former operation, to properly treat the persistent high colloidal water with a coagulant it is necessary to apply from 5 to 7 grains of alum per gallon of water to obtain coagulation and even the filtered water carries a color of from 30 to 50 part per million.

Since the softening equipment was completed in 1918, it has been possible to study the effect of the use of lime and alum with our conditions. The Flint river carries a hardness of 380 parts per million, including a permanent hardness varying from 25 to 70 parts per million. This water is softened to a 5-grain water, by lime applied by the dry-feed method. The lime is first applied to a caustic or overdose of from 25 to 35 parts per million, and this treatment breaks up the colloidal color and excellent rapid settling occurs with ½ to 1 grain of alum applied before the water enters the settling basins. The caustic alkalinity is also returned to a neutral water.



What the Lime Does

The use of lime not only produces a soft water, desired by industrial concerns, but solves the color problem without the use of a high alum feed which, used alone, would leave an excessive amount of carbon dioxide in solution in the filtered effluent.

Without the use of lime, it would be necessary to apply chlorine from .7 to .85 parts per million to obtain desired bacterial results, but with the use of lime to the point of removing bicarbonates and at the same time reducing the color below 20 parts per million, the chlorine can be reduced to .3 parts per million, and still have free chlorine excess over the absorption value sufficient to effect sterilization.

At a constant chlorine feed, the excess of chlorine over the absorption value of the water decreases as the color rises. There is no direct proportion between an increase in color and the variation of the chlorine absorption value. Without the use of lime to reduce color and hardness, it is difficult to keep the chlorine at an efficient point for sterilization of the water without running into the taste range.

With a high color and coagulant treat-

ment only, it is difficult to always keep below the taste range and produce bacterial results desired. Applying lime to the neutral point of water, thereby removing bicarbonates and reducing color to a low amount, permits of a low chlorine application.

Increases Road Construction

From observing conditions of the watershed of the Flint river, it is found that a great increase in road construction with well-designed drainage system and increase in county drains has had a great deal to do to eliminate the former natural filtering agencies on the catchment area. Where formerly the water sought its way to the river, in a large measure through underground sources, the water at the present time finds its way quickly to the river by means of better surface drainage.

It has been an interesting problem to observe the characteristics of the surface water and the gradual change taking place by the increase in construction of good roads and county drains. Road building, at the present day, is realized as a necessity for present-day progress, and millions of dollars are now being expended in this country for programs of this character.

If this example of the change in characteristics of the Flint river water is due to causes already mentioned, is it not probable that similar conditions can be looked for elsewhere?

As cities investigate the problem of procuring pure water from small river supplies, is it not expedient to look well into the softening and color problem? The use of lime solves the problem in the case of Flint, Mich.

Feeding quicklime with a dry-feed chemical machine is not as simple a problem as using hydrated lime, but there is a great chance for experimenting in design where a fine quicklime can be properly slaked and added to the water after passing the dry-feed machine.

Cost by Dry-Feed Method

The cost of using lime by the dry-feed method at this plant, which has a normal filter capacity of 16,000,000 gal. per day, is not as high as it would be using the solution system of controlling chemicals. A great saving in labor is made by using hydrated lime with a dry-feed apparatus. At this plant, three dry-feed machines are in use and only one extra man is required for softening over the number when coagulant alone was used. It is important for constant accurate application of the lime that the weight of chemical be kept fairly constant over the turning wheel of the dry-feed machine. When the larger storage bins are nearly empty, one extra man is required to break down a quantity of lime for the daily hopper over the dry-feed machine.

The accuracy of feeding dry lime can be determined from the accompanying diagram. This chart shows the variations of lime in grains per gallon on hourly tests for 40 hrs.

An average cost of alum treatment for a highly colored water of from 100 to 150 parts per million, is $139 per day, on a basis of 10,000,000 gal. and at the rate of 7 grains of aluminum sulphate per gallon, and a chlorine feed of .75 parts per million. The cost of lime treatment of the same water, on the same basis of pumpage, at the rate of 11 grains of lime per gallon, ¾ of a grain of alum, and chlorine at .3 parts per million is $127.75, a saving of $11.25 per day of chemical feed. This water so treated is softened, the color reduced, and is more to be desired from a mineral and physical standpoint than the alum treated water.

The field for the use of lime in water purification is greater than is usually realized by the layman, and any aid by the lime manufacturers or organized investigation of water treatment problems will mean, in the long run, a great increase in lime tonnage.

Miscellaneous Uses of Lime in Mining

By H. S. Hollis
Calumet and Arizona Mining Co.

A MAN not familiar with metal mining practice would be more than mildly surprised to know that many carloads of lime and cement, to say nothing of small forests of timber and tons of steel, are required to maintain an equilibrium absolutely necessary for efficient mining operations.

Why swap rock for rock? Why does a trainload of copper ore, rolling down the mountain to the smelter, occasionally meet and pass a car from a lime kiln at El Paso, Texas, to the mines at Bisbee, Ariz.? The following brief outline of the uses of lime in and about the metal mines may answer these questions:

In a new copper district, where deep mining is practiced, the ores are naturally first mined near the surface, and are usually oxidized in character containing malachite, azurite, cuprite and other compounds of elements in which oxidation is apparent. But the miner is never satisfied. Before he has exhausted his oxides, he looks for more ore and digs deeper. Sulphides replace the weathered ore formerly shipped from the upper levels. He now mines pyrite-carrying chalcocite, chalcopyrite, bornite and other sulphur bearing ores. He finds it difficult to work in the hot, moist, stagnant air and the ventilation engineer aids him by installing and maintaining a complete ventilation system.

Drawbacks of Fresh Air

Fresh air in drift and stope has certain drawbacks. Oxidation begins and in time becomes so active in the warm sulphide bodies that mine fires are not unknown, in which both sulphide and timbers are involved. Sulphate of iron, copper and sulphuric acid result, and the comparatively harmless mine water takes up these substances and demands attention.

The water must be pumped to the surface. If it carries sulphates of lime or magnesium or their carbonates, the problem is mechanical. If oxidation has transformed a water so that it holds in solution more or less sulphate of iron, copper and sulphuric acid, the method of handling becomes chemical and mechanical. It must be decided whether or not the copper is worth saving, also whether the pumps and water columns should be of an alloy suitable to resist the action of corrosive salts and acid. In case copper runs over 10 grains per gallon, it may be wise to precipitate cement copper on scrap iron or old tin cans, iron going into solution and copper percipitating out, to be recovered later. If copper is low and iron and steel pump and columns are already in use, it is often best to neutralize the acid and sulphates with lime and thus protect the pumping plant from slow destruction.

Cone shaped lime saturators, similar to those used in a lime-soda water treating plant, furnish a saturated lime water, the chemical reactions being as follows:

$CuSO_4 + 5\ H_2O + Ca(OH)_2 = Cu(OH)_2 + CaSO_4 + 5\ H_2O.$

$FeSO_4 + 7\ H_2O + Ca(OH)_2 = Fe(OH)_2 + CaSO_4 + 7\ H_2O.$

$H_2SO_4 + Ca(OH)_2 = CaSO_4 + 2\ H_2O.$

$Fe_2(SO_4)_3 + 3\ Ca(OH)_2 = Fe_2(OH)_6 + 3\ CaSO_4.$

At one mine, about 61,335 lb. of lime per month are needed to preserve an

alkaline reaction to phenolphthalein, a methyl orange alkalinity not being sufficient to precipitate out all of the harmful corrosive.

After treatment, 74,500,000 gal. of water per month are raised from the 1500- to the 1000-ft. level through a 12-in. steel column, the pump being a Prescott, Mesabi type, steam installation. From the 1000-ft. level another Prescott carries the water to the surface.

The water on the 1800-ft. level is pumped to the collar of the shaft by means of an electric pump. About 58,000,000 gal. are lifted per month, and a small part of this is treated with lime and soda ash for steam production. This water is free from corrosive salts but contains in solution approximately 25 grains of scale forming solids, half of which is bicarbonate of calcium and half a mixture of $CaSO_4$ and $MgSO_4$. Three tons of lime and three of soda ash supply a battery of 15 marine 260-hp. boilers with 3,500,000 gal. of softened water per month.

One carload of lime monthly is required for these and a few other purposes mentioned below.

Periodically, the stations and most important passages in the mine are sprayed with whitewash. Only small amounts of lime are used for construction about the mine due to the fact that most buildings are steel framed structures covered with galvanized iron.

At one time the question was raised as to the advisability of burning lime at the mine, but since a good grade can be obtained in El Paso of uniform available lime content, and at a reasonable price, the idea was abandoned.

Lime Making for Calcium Arsenate

An extensive market is being developed for high-grade chemical lime for boll-weevil control in the South. Alfalfa weevil and other insects are also fought with this new arsenical compound

By Howard W. Ambruster, New York City

AMERICAN lime producers, with one or two notable exceptions, have shown very little interest thus far in the requirements for their product for the manufacture of calcium arsenate. This lack of interest justified itself from the fact that the total required was small and the buyers, from the producers' standpoint, were fussy about quality to an unwarranted degree.

But recent developments in the use of calcium arsenate for boll-weevil control in the South have brought about a change in this condition. Lime manufacturers who are keen to develop new business and who have the proper limestone and facilities for turning out high-grade chemical lime are beginning to realize that this one requirement for calcium arsenate will probably attain sizable proportions within the next few years, and it is good business policy therefore to endeavor to supply for this purpose a high-grade lime of correct chemical analysis.

Amount of Lime Required

The amount of lime required for calcium arsenate is approximately one-half the total of the finished product. Allowing for loss in storage and operations, it can be figured at 55 per cent for the purposes of this article. In past years the largest consumption of calcium arsenate was only a few thousand tons, but this season, though accurate figures are not yet obtainable, there was a total used of between 7,000 and 10,000 tons and a much larger quantity would have been purchased by the cotton growers if they could have secured it at the time it was needed in July and August. In the past the record of this insecticide has been most erratic, and the economic value of this method of fighting the boll-weevil was open to question save among those who pinned their faith to the intelligent and farseeing policy of B. R. Coad, the government entomologist, who is primarily responsible for the initial use of calcium arsenate for this purpose; also for the educational campaign in which he has persisted with such tenacity to compel the manufacturers to supply a proper material and to teach the planter how to use it.

Speculation as to just how great a tonnage of calcium arsenate will be used in coming years is idle at this time. The maximum figures are too large to be used as a basis for intelligent planning on any phase of the industry.

Its Success as a Boll-Weevil Control

But now that cotton dusting is about over for the season and the results obtained are available for consideration, it can be stated as a positive fact that calcium arsenate has come into its own as a successful method of boll-weevil control. There is nothing else in sight which can show this accomplishment. The result must be a requirement for many times the previous consumption provided the product can be delivered to the cotton planter at a sufficiently low price. Not only are all of the existing manufacturers of insecticides planning on increased production and better methods of distribution, but new enterprises for the manufacture of calcium arsenate are starting up all over the country. The importance of this insecticide for the moment overshadows all other forms of agricultural sprays.

So while there will be no endeavor made in this brief article to indicate the total amount of lime which will be used ultimately by the calcium-arsenate manufacturers, the progressive lime producer need only assure himself that he has the facilities to warrant more attention to this part of his market than in the past.

Our difficulty has arisen in the contact between the calcium-arsenate maker and his lime supply. The former has endeavored to buy his supply on a basis of exact chemical analysis. The latter has responded that his chemical lime is good enough for this or that other purpose and he is not going to reorganize his quarry and kiln departments for a few hundred tons of lime.

Must Be High Grade and Uniform

The lime producer must realize, however, that the raw lime required for the calcium content in a compound made for rigid chemical specifications must be high grade and of a uniform quality, or the cost of manufacture of this dusting material and the danger of an inferior product will be so increased as to give the buyer just cause to look for another source. Lime which will be satisfactory for other insecticides like lime sulphur solution of Bordeaux mixtures, and for other chemical uses such as the wood pulp and tanning industry, may be absolutely unsuitable, or at least hazardous, for the calcium-arsenate maker.

Of course the prime requisite is the highest calcium oxide content obtainable. Buyers frequently insist on a percentage of from 95 to 96 per cent CaO, and there should be no reason why the lime producer

could object to an actual guarantee of this test.

Any appreciable amount of magnesia in the lime is fatal to its use for calcium arsenate as the presence of magnesia in the final product will get the maker in trouble with the government officials.

More than a trace of iron and alumina is also objectionable, but there is usually less difficulty on this score than on the magnesia; it is the latter which is associated so frequently with the limestone formations.

The preparation of the lime should also be such as to preclude the presence of any calcium carbonate remaining in the lime as shipped, and this factor and the physical condition have to do primarily with the operation of the producing plant.

During the World War and the period immediately afterward, when all raw materials were scarce and pressure for production caused slack control of labor, the lime producers shipped great quantities of so-called chemical lime which, while fairly satisfactory as to analysis of the lime itself, had so much silica and core mixed in with it as to be almost unusable for a product like calcium arsenate. The excuse of necessity no longer exists, and if the lime manufacturers can be brought to believe that the intelligent chemical manufacturer is willing usually to pay a premium to get a proper source of supply for his lime, it should not take a great while to standardize this important raw material for those industries like calcium arsenate where chemical control is a vital necessity.

What Requirements Are Needed

It is not the purpose of this article to advise the lime maker how he should get these results, but it is desirable at this time to indicate to him what is needed for a requirement which bids fair to widen his market and improve his selling price.

The uses of lime are so diversified and the requirements so at variance that many of the lime men seem to think it is not worth while to give attention to any problems but tonnage and cost, and they refuse to accept the fact that they are marketing a chemical product.

In its use in calcium arsenate it is strictly a chemical raw material and functions in a number of entirely different though related ways: as a chemical carrier for the poison; as a distributor to permit the widest possible area of affect; as an inhibiting agent to moderate the effect of the poison and prevent injury to the plant, and finally, as an adhesive to hold the poison on the plant until the weevil is destroyed.

In conclusion, the statement should be made that the possible increase in demand for chemical lime for calcium arsenate does not depend by any means on boll-weevil control alone; the alfalfa weevil, a serious menace in the West, is also being fought successfully with this arsenical compound, and the use of calcium arsenite is already established as a standard insecticide for orchard and truck sprays.

Lime for the Leather Industry

By C. C. Smoot, III
C. C. Smoot and Sons Co., North Wilkesboro, N. C.

DURING the last few years the art of manufacturing leather has been greatly aided by science. The old order has given way to the new and materials once thought to be indispensable have gradually been eliminated until today the larger portion of the leather manufactured is put through a quicker and better process without the use of materials once looked upon as absolutely necessary. But from a few materials of the old order that have retained their usefulness, lime stands out as an essential factor in the present-day method.

Before a hide is tanned it is usually necessary to remove the hair or wool; "sweating" was the earliest method in accomplishing this. The success of this method of unhairing depended first on the depilation properties upon putrification of the mucous matter around the roots of the hair, allowing the hair to be loosened. This method, however, required very close control as the skin itself was subject to attack, thereby causing weak grain.

In the form of calcium hydroxide, lime possesses strong depilatory action, and is the agent almost universally used for unhairing. The valuable advantages so much out-weigh whatever disadvantages it may possess that it is very difficult to find a substitute for it. Many new materials and methods for unhairing with more or less success are being introduced on the market today. With all other materials and methods, exact time and exact quantity are important factors and require highly skilled labor to operate them. With lime, however, on account of its limited solubility in water, ⅛ of 1 per cent can be added in excess without forming a dangerous concentration and the process can be safely carried out with the commonest labor.

Limestone is the universal source of lime, and when burned slowly at a low temperature gives a light and porous lime which slakes readily and is rapidly converted into calcium hydroxide. When, however, limestone is overburnt the impurities fuse and make slaking slow and difficult. Lime of this character, unless very carefully slaked, would produce a solution in which small particles of unslaked lime were carried over into the lime liquors where they burn holes in the hides by slaking while in contact with them, thereby causing what is known as lime burns. This is also true of certain impurities, for, on account of the limited solubility of lime in water referred to above, the less the impurities that dissolve to the exclusion of the lime, the purer the product, the better for the tanner.

As received at the tannery, lump lime is more or less attacked by the moisture and carbon dioxide of the air converting it into the carbonate and air slaked lime. This air slaking property causes a loss by reducing the amount of available lime. Hydrated lime as now found on the market is more or less free from this objection and can be as successfully used. A good lime has from 90 per cent up of available calcium oxide, while a poor one has 50 per cent or less.

Impurities to any appreciable extent are objectionable. A high percentage of magnesium causes poor slaking, while a lime with more than 1 per cent iron may be the source of what is known as iron stains, causing poor color and a lack of plumpness. The causticity of lime causes a swelling of the hide which is very desirable if properly controlled, leaving the hide in condition to absorb the liquors after the bating operation.

Iron which tends to combine with the collagen has a tendency to decrease this swelling, and as all iron salts form blues and blacks in connection with the vegetable tanning materials, it is a very undesirable constituent. From a purely theoretical point of view only 1 per cent lime on the green weight of the hide would be necessary to be added in lime liquors but it is a common practice that this is added up to practically 5 per cent so that the solution could always be kept at saturation. An unsaturated solution of lime has a tendency to allow bacteriological action to proceed more rapidly than where the saturated solution was used, thereby increasing the danger of damage due to this cause. Lime solutions are used from varying lengths of time dependent upon the character of leather desired to be produced. Cold, fresh, sweet limes will produce firm plump leather; warm, old limes will produce a mellow, soft tannage.

Lime in Glue and Gelatin Manufacture

By Robert H. Bogue, Ph.D.
Industrial Fellow of the Mellon Institute of Industrial Research of the University of Pittsburgh and Research Chemist for Armour & Co.

LIME is used in the manufacture of glue and gelatin in the preliminary treatment of the hide pieces, ossein, sinews, or fleshing stock in order to bring these tissues into the condition most suitable for the "boiling" or extraction process which follows. Just when lime was first utilized for this purpose is not known, but its use has been the general practice of all manufacturers of glue and gelatin for as far back as can be followed.

Like so many important discoveries, it seems certain that the particular value of the lime in this case was found by accident rather than by any systematic search, and, indeed, even today many of the smaller manufacturers who use it daily fail to recognize the properties or qualities by virtue of which it stands quite alone in this field.

In the manufacture of the glue or gelatin, the stock mentioned, after a proper washing and shredding (in the case of hides and fleshings) is placed in large vats and thoroughly admixed with a suspension of lime (calcium hydroxide or water-slaked lime) in water. The stock is allowed to remain in this suspension for a few weeks with occasional turning and then placed in a fresh suspension. This change may be repeated two or more times, or until the stock has acquired a plump, uniformly swollen appearance. The subsequent operations consist of a washing and acid treatment to remove the excess of lime; a "boiling" operation to extract the gelatin or glue; a clarification or filtration; an evaporation in vacuo; a cooling to produce a jelly; and a cutting, drying and grinding to bring the material into the customary form in which it appears on the market.

The Object of the Liming Operation

With this very brief survey in mind, we may ask what is the object or purpose of the liming operation. To the casual observer there will be noticed a number of changes in the appearance of the stock as a result of the lime treatment. The most obvious change is the increased volume. The pieces of hide have increased in thickness to several times their original cross-section. They have taken on a firm feeling and are rigid. The hair on these hide pieces has either fallen off during the liming or is held so loosely that it is easily removed by a mere rubbing with the fingers. These are the physical changes which have taken place, and until recently were all that was known of the liming reaction.

The value of the lime appears to be due to two major properties; one, the pysical effect resulting in the plumping referred to; the other, the chemical effect due to a solution of certain constituents of the hide.

The purpose of plumping before "boiling" appears to lie in the production of a more readily soluble stock. The original stock, if boiled with water, would go into solution but slowly and with difficulty. Prolonged heating at a high temperature would be necessary. But such drastic treatment would result in the production of a very low-grade glue or gelatin. To get a product of high jelly strength or of high viscosity, the stock must be subjected to only moderate temperatures and the extraction must be accomplished in a few hours.

Now a well-plumped stock meets these conditions while the original material does not. This is probably due to a loosening of the fibers of the hide pieces by the lime. These fibers, which constitute the corium layer of the skin and consist of collagen, are held together very rigidly into bundles, but on treatment with lime they separate slightly, thus permiting an enormously greater surface exposure to the solvent and consequently greater rapidity of solution.

"Plumping" Action

It appears that this plumping action is due to a certain definite concentration of hydroxylions, or alkali. It just happens that a saturated solution of lime is of very nearly that optimum concentration. If it were stronger or weaker solution would give less swelling, and a stronger solution would dissolve some of the collagen. But if we used only a saturated solution of the lime, the hydroxylions, or alkalinity, would rapidly become neutralized by the stock, and after a few hours or days the solution would be found to be practically neutral. So it would be necessary to constantly add more lime to take the place of that used up by the stock. This tedious operation is avoided, however, by adding to the stock not a saturated solution of lime but a suspension of lime in water. Then, as the lime in solution becomes depleted by the stock, more of the solid will dissolve, so a saturated solution is maintained. The concentration becomes automatically held at that point which is most favorable for hide plumping.

The chemical service played by the lime is one of solution. Glue stock contains, besides the collagen which is converted into gelatin, many other types of protein which are of no value whatsoever and by their presence lower the value of the resulting product. Thus the connective tissues contain elastin, cartilage contains mucin, and hair contains keratin. Albumins are always present. Lime has the power of dissolving out the albumins and the mucins, and to some extent the others named. If an alkali stronger than lime is used, the collagen will also be dissolved, but this would be a direct loss as the collagen is just what we want to retain. So here again the lime is peculiarly well adapted for the service. Turbid and opaque glues or gelatins are often the result of an improper liming, for a failure to remove the albumins and mucins may result in their precipitation by acid at a later stage, and such precipitation invariably leaves a cloudiness in the finished product.

By the solution of the albumins, the hair—which is largely embedded in the layer of elastin directly below the epidermis—becomes loosened and is easily rubbed off. Some of the fat of the stock is also acted upon by the lime, it being saponified into an insoluble soap which must be eliminated during the washing process if a clear product is required.

The writer has found that dolomitic limes, e.g., those containing much magnesium oxide admixed with the calcium oxide—are decidedly inferior in their plumping action to the straight calcium oxide. In practice it is usually more satisfactory to buy a high grade straight lime and slack it at the plant just prior to use. Why the presence of much magnesia should so seriously reduce the value of the lime for our purpose has not been definitely established.

Incidentally, lime is a very good germicide and, while some kinds of bacteria thrive in its solutions, the putrefactive organisms are almost entirely killed or inhibited. For this reason other preservatives are seldom used during the liming process.

Conclusion

To conclude, lime is of particular value to the glue and gelatin manufacturer, (1) on account of the plumping which it

induces in the stock and so greatly favoring extraction, and (2) on account of the solution which it brings about of several undesirable constituents in the stock. It is especially well adapted, as the concentration of its saturated solution is most favorable for the purposes given, and this concentration is automatically controlled by the solubility of the lime.

Using Lime to Mark Highway Obstructions

By P. E. Burroughs
District Engineer, Maryland State Roads Commission

THE question may be asked: "Why are obstructions marked along highways?" They are marked to add to the neatness and the appearance of the highway which indirectly acts as a stimulant to interest the farmers and other property owners to keep their property neat and trim.

They are marked so that at night it gives to the driver of an automobile an added confidence in avoiding these obstructions and thereby eliminate many accidents which might otherwise occur. It gives him a guide to see ahead so he can prepare himself for sharp curves, etc.

The marking of public service poles, culverts, headwalls, and the obstructions along Maryland's highway system was inaugurated several years ago, and in carrying out this work in District 1, which comprises Dorchester, Wicomico, Somerset and Worcester counties, the writer became interested in obtaining a formula for a marking material, using lime as a base, which would be cheap and also able to withstand the elements for the longest period of time.

Why Lime Solution Is Used

Another question: "Why is a solution with lime as a base used?"

The greater portion of obstructions to be marked are public service poles. From year to year a large number of these poles are replaced with new ones. This in itself eliminates any argument for an expensive paint, because new poles must be painted, and as during the first year a pole will bleed, so it would necessarily ruin the wash, whether expensive or cheap.

The marking of obstructions with the lime solution therefore cares for both conditions—it is cheap and it is done each spring, which cares for any new poles or obstructions which may have been placed.

It was with this in mind that we conducted during the winter of 1921 a series of experiments and observations, with results as shown in the table. These observations showed conclusively that molasses renders the lime more soluble and causes it to penetrate the wood or surface. Adhesive power is given to the wash by the addition of alum. Hydrated lime or a factory slaked material is preferable to a hand or field-slaked lime.

The molasses used was the common stock feed variety, which is the refuse from fine sugar and contains little if any glucose or sucrose. By combining these facts the formula selected and used without alteration since that time, and which has given most excellent results as to lasting qualities and cheapness, was as follows:

½ bag hydrated lime 25 lb.
6 lb. common table salt
1 pint common molasses
3 oz. ground alum
10 gal. hot water, about 175 deg. F.

This solution, when mixed and ready for application, gives a light yellowish paint, due to the molasses, but upon drying gives an extremely white finish that after about seven to ten months showed no appreciable discoloration or scaling. The finish on the poles is much better the second year, because new poles bleed and discolor. The different kinds of wood have an influence upon the effect, especially the first year. Cypress and chestnut bleed less than most other woods.

The best and most economical results were obtained by the use of the following equipment and organization:

1 ambulance truck
1 50-gal. heating kettle or tar pot
2 bbl. for mixing
6 3-gal. pails
Strap and 6-in. brushes
Foreman and chauffeur
Four painters

Material Needed

The material necessary for one day's work was taken out each morning. About 10 bags of lime are used each day and a proportionate amount of the other ingredients. The kettle for heating the water tailed the truck and this as well as the mixing barrels were stored along the road over night. Heating the water and mixing the wash are done along the road by the chauffeur and foreman at points where water is easily accessible ahead of the men painting the poles. In this way a sufficient amount of mixed material and

EXPERIMENTS

FORMULAS USED

(A)
(1) ¼ bag of lime, slake with 3 gal. hot water.
(2) ½ lb. table salt, ¼ lb. sulphate of zinc, dissolved in ½ gal. boiling water.

(B)
(1) ¼ bag of lime, slake with 3 gal. hot water.
(2) 3 lb. of salt, dissolved in 2 gal. hot water.
(3) 3 oz. of alum, ½ oz. per gal.

(C)
(1) ¼ bag of lime, slake with 3 gal. hot water.
(2) 3 lb. of salt dissolved in 2 gal. hot water.
(3) 1 pint of molasses.

(D)
(1) ¼ bag of lime, slake with 3 gal. hot water.
(2) ½ lb. of table salt, ¼ lb. of Epsom salts, dissolved in ½ gal. boiling water.

RESULTS AS NOTED

Date (1921)	Temperature Deg.	Condition of Weather	Remarks
Feb. 16	45	Clear and windy	A and D seem to rub, B and C not rubbing.
Feb. 17	60	Clear and windy	All mixtures showing up white; B least to rub.
Feb. 18	28	Clear, light wind	A and D seem to be hardening, B least to rub.
Feb. 19	36	Cloudy, rain 8 a.m. and continued during the day	B decidedly the whitest and hardest to rub off.
Feb. 20	40	Rain, snow, 5:00-9:00 p.m.	Mixtures show up white in order named—B-D-A-C.
Feb. 21	26	Hail, rain, and snow	C seems to be holding up best under past weather.
Feb. 22	36	Snow flurries, clearing weather	Cypress poles bleed less than chestnut.
Feb. 23	42	Cloudy and damp, rain 12-1	Poles wet and no definite results obtained.
Feb. 24	32	Cold and windy, night clear	No scaling as yet noted.
Feb. 25	38	Partly clear and cold	Poles dry on wind side, wet on opposite; no results.
Feb. 26	40	Partly clear and cold	A and D on chestnut poles are scaling in places.
Feb. 27	45	Raining at intervals	B and C show no scaling on either pine, chestnut, or cypress poles.
Feb. 28	48	Clear and warmer	The scaling of A and D seem to be increasing.
Mar. 1	48	Clear and warmer	Scaling on A and D poles seem to be greatest on north side of poles.
Mar. 2	52	Clear and warmer	A and D seem to be losing their white color.
Mar. 3	44	Raining	B and C stand out best, with B best of all.

hot water is always at hand. Each one of the four men painting the poles are supplied with one pail of wash, enough for 10 ordinary poles; a brush of high grade, because of its lasting qualities; and a leather strap lashed around the pole to insure a neat line at the top of the treated section, which is ordinarily about 4½ ft. above the ground. The painters are separated 10 poles apart and then transferred ahead by the truck in "leap frog" fashion.

All trees, projecting fence posts, culverts, headwalls, and so on, that fall within each painter's area are taken care of as well as the poles. In case of a double line of poles, one man is assigned to each side of the highway. All culverts and bridges up to 25-ft. spans were washed on the roadside and two ends, the outside face being omitted except where the headwalls fell on the inside of a sharp curve. Four men painting poles are an economical maximum for this class of truck. There is no necessity of a man having to wait for the truck to carry him ahead. This method is by far the cheapest, because when spraying is considered there is the initial outlay for the spraying apparatus, then the maintenance when in use, and the inconveniences it is sure to give to traffic in one way or another. Again, as will be seen when cost per mile is considered, I feel sure that no one will doubt that hand painting is the more satisfactory, both as to economy and minimum maintenance of equipment.

An accurate cost record of this work has been kept covering several years. During 1921, in the four counties in this district, there were 37 maintenance contracts with a total of 220.19 miles, painted at an average cost of $2.71 a mile.

This cost varied per mile from 80 cents to $4.80, which was due to single, double or triple pole lines, number of culverts, headwalls, trees, and other conditions encountered on different contracts.

The average cost per county was $2.59, $2.77, $2.62, and $2.85 respectively.

The cost, 1921, was distributed as follows:

Labor	$1.48
Straps and brushes	.06
Lime	.48
Salt	.08
Molasses	.06
Alum	.12
Truck expenses	.43
	$2.71

It can therefore be seen that the additional ingredients, salt, molasses and alum, are negligible, as far as cost is concerned, which justifies their being used when their value to the solution is considered.

The formula given has been in use for two years and has lasted well through each year. The results have been so satisfactory in this district that the formula has been adopted over practically the entire state.

Help for a Rock Products Industry

The proposed reduction in tariff from $10 to $6.25 a ton on crude magnesite, and from $15 to $12.50 a ton on calcined magnesite imports is said to seriously threaten the American magnesite industry. At these figures foreign competition, with its cheaper labor, will be enabled to undersell the American products, and domestic producers are taking steps to have the Senate change its course in cutting the higher duties quoted, which were fixed by the House, to the lower figures. The bill passed by the House included the higher duties, but the Senate reduced the figures to $6.25 and $12.50.

Rock Products has sent a copy of the accompanying letter to all Illinois senators and representatives in Congress in an effort to aid the domestic magnesite producers in their fight for the higher tariff.

TRADEPRESS PUBLISHING CORPORATION
542 South Dearborn Street
CHICAGO

NATIONAL BUILDER · · ROCK PRODUCTS

September 6, 1922.

Honorable Medill McCormick,
Member United States Senate,
Washington, D. C.

Dear Sir:

As one of the editors and publishers of Rock Products, a journal devoted to the non-metalic mining industry of this country, I wish to state that a change made by the Senate in the original Fordney bill, reducing the tariff on crude and calcined magnesite, is, I am convinced, a serious matter to the magnesite producers of the United States and will unquestionably stop the development of an industry in this country which offers very great possibilities. I refer not only to the producers of crude and calcined magnesite in California, but to some very interesting experiments in making magnesite from dolomitic limestone, of which we have large deposits in the State of Illinois.

As you probably are aware, dolomitic limestone can be burned and treated in such a way as to produce lime and magnesite; and while, as yet, chemists have not developed a commercial process to separate the two, I am convinced that such a development is a matter of the near future, providing the magnesite industry in this country is given any encouragement.

Yours very truly,
TRADEPRESS PUBLISHING CORPORATION.

Nathan C. Rockwood
Vice President.

NCR:AAK

Terre Haute Meeting of Sand and Gravel Producers

THE Wabash Valley district of the Indiana Sand and Gravel Producers' Association met on August 23 at Terre Haute and 21 producers attended. This meeting was called to consider the "Proposed rules governing charges for switching cars returned to loading point" promulgated by the C. F. A. Railways, the car-supply situation and other business.

It was recommended that the association protest the proposed rules and ask the co-operation of the other states in that territory. A resolution was also passed recommending that the association protest to the I. C. C. against the discrimination in Class 5 of Service Order 23, and that a copy be sent to the Public Service Commission, senators and representatives, the Indiana Crushed Stone Association and to other service and producer associations in C. F. A. territory.

In a Stage of Siege

THE present situation is one of siege, says *Traffic World*, in its editorial comments on September 2. Transportation conditions have been affected by the strike since the first few days of its existence. In some localities conditions have grown worse. In others they have grown better. But we suppose it is fair to say, generally speaking, that the transportation situation, at the time of the New York conference, was more serious than at any other time since the strike began. Much of the condition was caused by the coal strike, of course, but we are speaking now of the railroad strike and its effects. It has seriously affected transportation.

"But we are equally impatient with those who, through political motives or because of a shallow understanding of economic conditions and the people that constitute this republic, refuse to deal firmly with the situation through enforcement of the law and the protection of the railroads in the operation of their properties, or talk wisely about the necessity of the government taking the roads and operating them itself.

"The way is clear now for the adoption of the policy that we have said from the first should prevail. The attitude of the railroads and of the government should be that there is nothing to arbitrate between the strikers and the railroad managers; that the strikers cannot be heard unless they return to work under the award of the Railroad Labor Board; that the railroad managers cannot be asked to violate proper pledges made to men who took the places of the strikers; that whoever is guilty of violence or any other crime or misdemeanor in the endeavor to hinder the operation of trains and the function of transportation shall be punished to the full extent of the law; and that the power of the government shall be exerted in all possible ways to protect the railroads in the operation of their trains.

"We say the way is clear for this policy, but it will not be quite so easy to travel as it would have been at first. We have, first, to contend with the growing popular impression that the struggle is between the railroad managers and their men and that there can and should be a little give and take. That is the result of the policy of temporization and conciliation that has been followed by the national government. The way is not quite so easy as it would have been at first, but it is open and it seems the only way—except for government operation.

"And—shades of W. G. McAdoo!—some are really talking about government operation of the railroads, as if we did not know, after our war experiment, that government cannot do for or with the railroads what they cannot do themselves, if they are permitted, and as if we had forgotten in what a wrecked condition it left them and their affairs. The cry for government operation arises from the fear, based partly on timidity and partly on failure to understand the temper of the people, that we are in the midst of an 'industrial crisis' and that there is danger of a 'revolution.' Those words make us sick. The politicians do not know it, some business men do not know it, and there are others who do not know it, or, at least, stop to think of it, but the fact is that perhaps something more than 99 per cent of the people of this country, differing in politics, religion, and everything else in which there is room for difference, are yet one in that something that would lead them to back up a policy based on fairness and righteousness.

"We are not speaking of other questions that confront the nation, but the country needs a firm, courageous transportation policy that will back up the railroads in their rights; command law enforcement, no matter who suffers; sustain the dignity of its constituted agencies where, in the course of their duties, they have had occasion to act on transportation matters; and otherwise keep its hands off. We are opposed even to giving the president power to take over the railroads on the theory that it would only be to give him a weapon to be used in a possible emergency and that he would not use it at this time. We fear that, with the weapon in his hand, he might be induced to use it when it was not necessary. We should prefer to leave to Congress the function of deciding when the emergency had arrived. Should it arrive in such proportions as to justify another taking over of the railroads by the government, it would certainly be noticeable enough to impress Congress with the importance of taking action. If Congress did not choose to take it, it would be no worse than if the President did not choose to take it.

"We see no prospect for an immediate and definite settlement of the strike, but if we can have a policy of law enforcement and proper protection for the railroads and their men with the government otherwise refusing to participate, and if the brotherhoods continue their policy of refraining from a general sympathetic strike, we believe the shopmen's strike will gradually settle itself. The men will drift back to work or their places will be taken by others. The roads may have made a mistake in pledging themselves as to seniority rights, but so did the men make a mistake when they struck and refused to return to work in response to the ultimatum. The men must lose because they were wrong and propose to win by compelling a further wrong. The roads must win because they are right in keeping their promises, even though they may wish that they had not made them. It is only a promise of wrong that is better broken than kept. Their promise was in no sense wrong and it seemed wise to them at the time."

The Illinois Association

TWENTY-ONE members are now on the rolls of the Illinois Sand and Gravel Association. This association was formed three months ago, but no details concerning the organization have been available until a few days ago when Secretary McGrath made public a part of the records of the first meeting.

This meeting was called in the following letter signed by eight producers and sent from Peoria, on May 27, to various operators:

"It will probably require no great mental effort to recall the meetings held in various down state cities by members of the old Illinois Sand amalgamation with interests identified with the and Gravel Producers Association, prior to its Chicago Market.

The feeling of good fellowship predominating in these meetings and the close business relationships and personal friendships established by reason of them was discussed informally recently at a gathering of representatives of the firms whose names are signed to this letter.

"In view of what appears to be the impending dissolution of the Illinois Concrete Aggregate Association we feel that it would be a great pity not to get together from time to time, forget business cares and differences and have a good old fashioned celebration.

"The first event on the program will occur Wednesday, June 7, at 10 o'clock in the morning at the Jefferson Hotel, Peoria, Ill. May we depend on you to be present with as many members of your organization as you can spare. It will be worth your while.

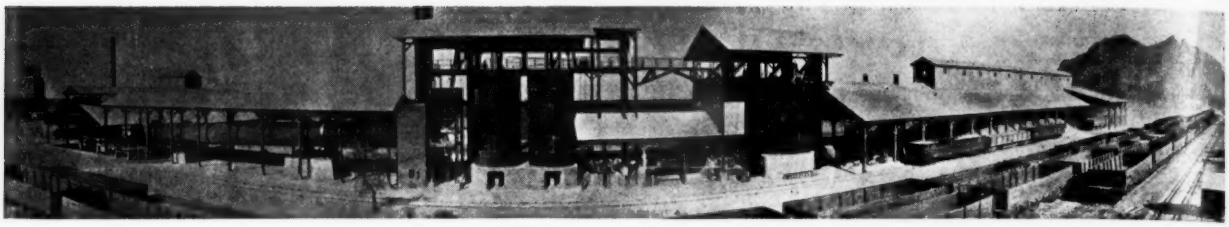
"Send your acceptance to D. S. Brown, care of Peoria Washed Sand and Gravel Co., Peoria, Ill."

The meeting was held, a constitution adopted, and the following officers elected: President, H. H. Halliday; vice-president, O. J. Ellingen; secretary-treasurer, T. E. McGrath; executive committee, H. E. Neal; Beder Wood.

All producers of sand and gravel who market any of their products in Illinois are eligible for membership. The dues are not to exceed $25 a year.

Following are the present members of the Association:

Automatic Sand and Gravel Co., Muscatine, Iowa.
Carmichael Gravel Co., Danville, Ill.
H. D. Conkey and Co., Mendota, Ill.
Galesburg Sand and Gravel Co., Galesburg, Ill.
Hans Gous Co., Davenport, Iowa.
Hahn-Muscatine Gravel Co., Muscatine, Iowa.
H. H. Halliday Sand Co., Cairo, Ill.
Joliet Gravel Co., Springfield, Ill.
Lincoln Sand and Gravel Co., Lincoln, Ill.
McGrath Sand and Gravel Co., Lincoln, Ill.
Mississippi Lime and Material Co., Alton, Ill.
Mississippi Sand and Gravel Co., Burlington, Iowa.
Missouri Portland Cement Co., St. Louis, Mo.
Moline Consumers Co., Moline, Ill.
Neal Gravel Co., Mattoon, Ill.
Peoria Washed Sand and Gravel Co., Peoria, Ill.
Rock Island Sand and Gravel Co., Rock Island, Ill.
Springfield-Pekin Sand and Gravel Co., Springfield, Ill.
Western Sand and Gravel Co., Spring Valley, Ill.
Beder Wood's Sons Co., Moline, Ill.
Yourtee-Roberts Sand Co., Chester, Ill.



The new plant, from crushing room to clinker storage. The clinker grinding room and the stock and packing house are behind the clinker storage building and cannot be seen

A New Cement Plant in Mexico

By H. E. Leach
Superintendent, Cemento Portland Monterrey, S. A.

This 900-bbl. dry-process plant, American made and equipped, has just completed six months of successful operation

IN MARCH of this year the new plant of the Cia. de Cemento Portland, Monterrey, S. A., was put into operation, and notwithstanding the general business depression the product has enjoyed a ready market.

The plant has a capacity of 900 bbl. per day and is dry process plant, using crude oil as fuel, and is driven by individual motor drives, being equipped throughout with Allis-Chalmers motors. The power is purchased from The Cia. de Tranvias, Luz y Fuerza Motriz de Monterrey. The plant is located in the city of Monterrey.

This cement company was promoted and organized by Sr. Don Lorenzo Zambrano, one of the leading business men of Monterrey and is a Mexican company. The plant was designed, equipped and constructed by an American engineer, H. E. Leach, who was for several years connected with the Cia. de Cemento Portland "La Tolteca" S. A., when that plant was built near Mexico City. Mr. Leach will continue in the capacity of production manager.

Starting excavation for the crushing plant. The present clinker grinding room was previously the puzzalano cement plant, shown here

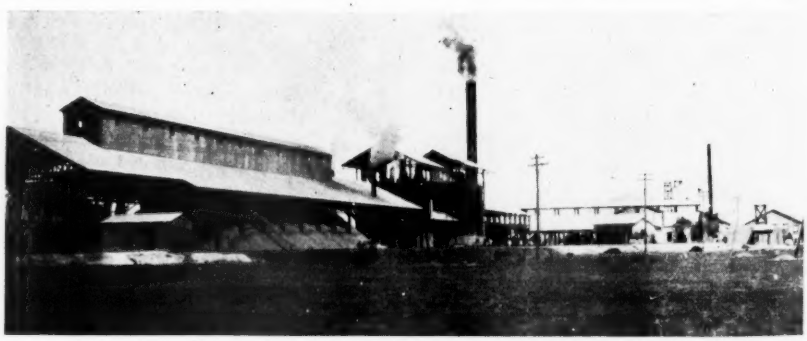
The raw materials are of excellent quality and the plant is equipped with the latest improved cement making machinery, all of which was imported from the United States. The plant operation and chemical control is directly in charge of American experts. The product is a high grade portland cement, filling all requirements of American and European specifications.

The Quarries and Crushing Plant

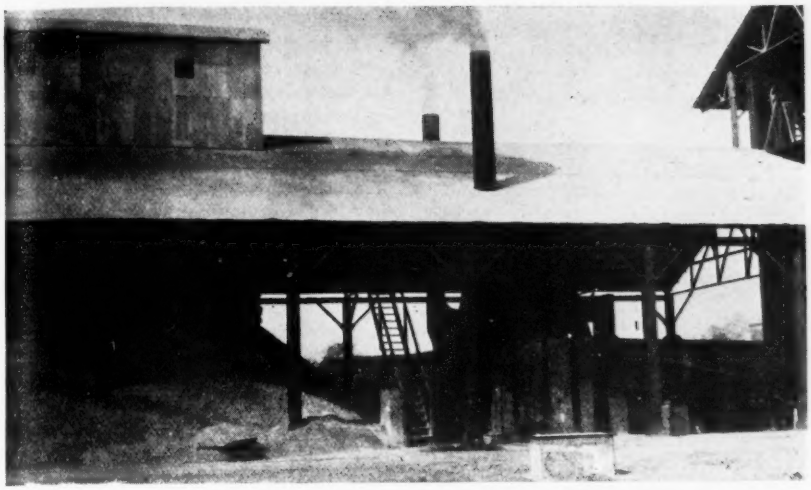
The limestone and shale deposits are located some 28 miles northwest of the city of Monterrey and in them are found almost inexhaustible quantities of uniformly high quality raw materials. The materials are transported to the plant in standard gauge, self-clearing hopper bottom steel cars. A train is operated daily and at arrival at the plant the train is passed over track scales and a report made of tonnage received and the train is then delivered to the crushing plant.

This crushing plant is equipped with a No. 6 primary gyratory crusher, a 60-in. x 12-ft. revolving screen fitted with 1¼-in. perforations, a No. 25 high speed gearless gyratory crusher, two belt-bucket elevators and an 18-in. flat belt conveyor, with a two-way, self-propelled, belt tripper for distributing the materials over the crushed storage. The material feeds by gravity from the self-clearing hopper bottom cars into the No. 6 crusher, is elevated to the screen overhead, the screenings gravitate to a feed box of the second elevator, the oversize feeding directly into the No. 25 secondary crusher, discharging into the same feed box with the screenings and is elevated to an 18-in. flat belt conveyor extending full length of the crushed material storage building.

The belt conveyor is equipped with a two-



Here's how it looks now, looking northwest from the crushing plant

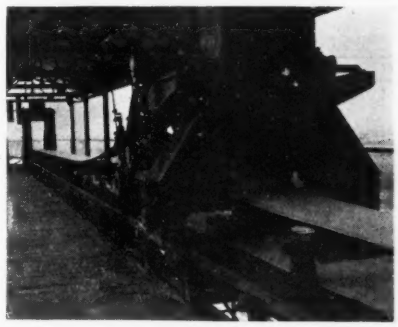


In this side view of the driers, the end of the shale and stone storage is seen at the left and the dry storage tanks are at the right

way, self-propelled belt tripper which discharges the material at fixed stations 16 ft. apart and to either side. The limestone is discharged to one side and the hard shale, which is handled through the same plant, is discharged to the other side. A partition the full length of the building keeps the limestone and shale separated. The crushing plant and distributing belt conveyor over storage runs as a unit and a Durant productimeter records the operating time of the plant, which is driven by a 100-hp. slip-ring motor. The crushing plant equipment, excepting motor, was furnished by the Kennedy-Van Saun Manufacturing and Engineering Corporation of New York.

Storage and Drying

This building is 162 ft. long and 60 ft. wide, with a partition extending full length through the center, the limestone being deposited to one side and the shale to the other, as previously explained. The belt conveyor 40 ft. above grade or floor line enables the material to be piled to considerable heigh. Two tunnels, one under the shale storage and one under the limestone storage, extend full length under the storage. Each tunnel is provided with nine disc extractors located 16 ft. apart and in line with the belt discharge stations above. The extractors run as a battery and are driven by a variable speed motor with control at the drier. The extractors feed a 16-in. flat belt conveyor which discharges into elevator feeding the drier. In this way each of the



This belt conveyor and tripper delivers the material from crushing room to crushed shale and stone storage

two materials is drawn from nine different points along the storage, effecting a blending of the material, which not only tends to chemical uniformity but physical uniformity as well, of each of the two different materials as fed to its respective drier. A productimeter records the operating time and the tonnage of each of the materials drawn from storage each day.

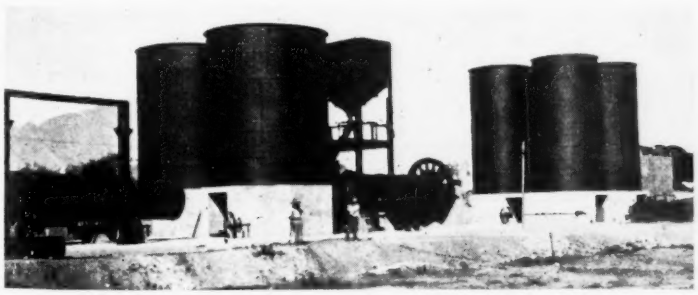
Two Ruggles-Coles driers are used, one for shale and the other for limestone. Each drying unit, consisting of feeding belt conveyor and elevator, drier and elevator for dry material to storage, is driven by a 20-hp. motor. Provision has been made so that either drier can be driven by either motor and either drier can be used for either of the two materials to be dried, in case of emergency. Crude oil is used for fuel and the consumption of each drier is recorded by Niagara meters.

Each of the dry materials is either carried by belt conveyor to the mixing hoppers over the raw grinding mill or stored in silos, from which it is drawn and delivered to the mixing hoppers as required. The two silos have capacity for 24 hours' supply to the mill.

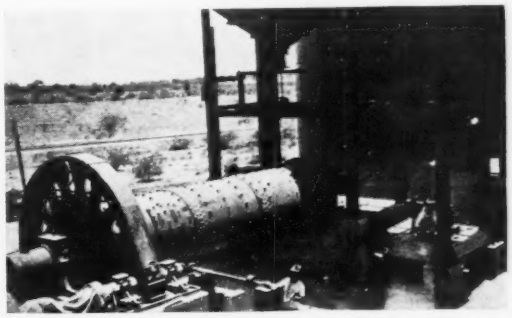
Proportioning and Raw Grinding

The two materials are drawn from their respective hoppers located above the feed end of the mill, by means of feed tables, one for limestone and one for shale, direct connected to each other. When necessary the proportion can be corrected by either raising the telescope feed pipe of the table or by shifting the scraper blade. As the two materials have already been standardized for size and chemical uniformity, as drawn from the crushed material storage, the continuous feed table proportioning gives very uniform results. The materials from the feed tables gravitate to the feeder of the mill and as no storage is provided for unground mixture, the only material that is beyond the control of the chemist is that which is in the mill, so that he has very ready control of the mix.

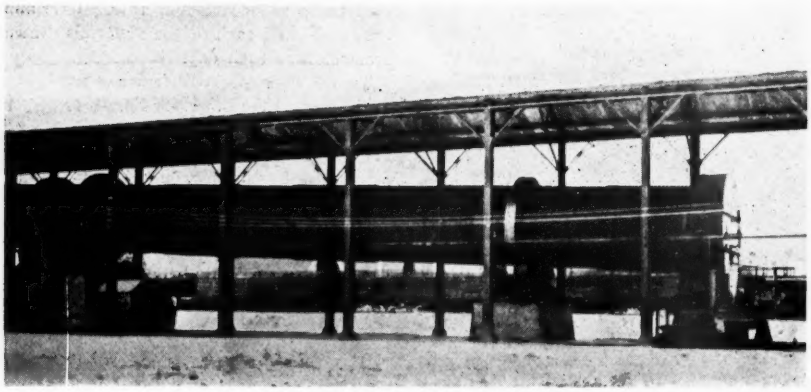
The battery of feed tables is driven from the countershaft of the mill and run at positive speed, but by means of tight and loose pulleys the feed to the mill may be stopped in case of mill congestion, or for cleaning out the mill. In the beginning the speed of the feeders could be varied by means of a Moore and White speed change, but it was found that changing the speed also changed the proportion of the materials, due to une-



Driers at the left; dry storage tanks; mixing hoppers and raw grinding compeb mill; ground material raw storage; and feed end of the kiln is the order of equipment shown here



A closer view of the raw grinding compeb mill and mix hoppers to the right and above the feed end of the mill

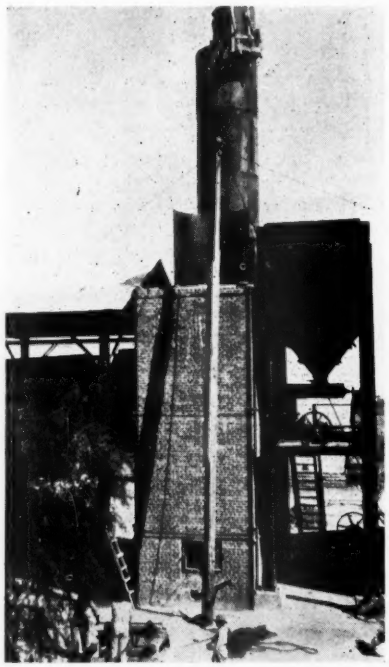


Side view of kiln from the west side

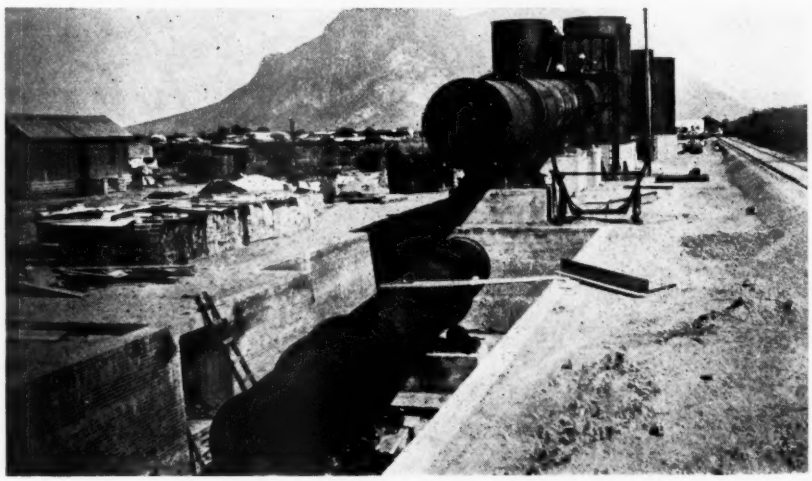
qual slip of the material on the disc. The amount of mixture discharged from the tables each revolution was adjusted by trial runs and fixed to the maximum amount the mill would handle, consistent with fineness of finished product, and in this way the mill is more consistently fed than if left to the unreliable judgment of the attendant and due to the uniform feed no difficulty is experienced with fineness control.

The grinding is done in a 6x24-ft. compeb mill, the preliminary end being charged with 16,000 lb. of assorted 2½ to 3½-in. steel balls and the finishing end charged with 51,000 lb. of 1¼-in. concavex balls, and is driven by a 350-hp. synchronous motor direct connected to the countershaft by a Cutler-Hammer magnetic clutch. The switch panel is provided with an ammeter which is very useful in judging the working condition of the mill. When the mill is working best the amperes go up and as the mill congests the indicator shows low amperes. The feeding or proportioning tables, the mill, the elevator and screw conveyor delivering the finished product to storage run as a unit. A productimeter records the tonnage of mixture fed to the mill daily and another productimeter records the operating time of the mill.

The raw material from the mill is delivered by overhead screw conveyor either directly to the feed hopper of the kiln or may be stored in five large silos, the storage capacity being ample for three day's operation of the kiln. The storage silos are used not only as storage but for blending the material before sending in on to the kiln hopper. The material coming from the mill is distributed so that one-sixth of the product goes directly to the kiln feeding hopper, the remainder being intermittently deposited in either of the five silos from which it is reclaimed, from all five silos simultaneously, and sent on to the kiln feed hopper, thus blending six lots of material into one before feeding it to the kiln, giving the same effect as a six-mill installation instead of a one-mill installation, as it is. In this way any fluctuation either chemical or physical is blended out before reaching the kiln.



The kiln feeding hopper



Just before connecting kiln and cooler. One clinker reclaiming tunnel is shown to the left of the cooler

Burning and Cooling

The installation for burning and cooling the clinker consists of a 9x120-ft. rotary kiln and a 6x50-ft. rotary cooler, both made by Vulcan Iron Works. The discharge of the hot clinker from the kiln to the cooler is by gravity. A reasonably tight connection between the two provides that the draft of the kiln induces cool air into the discharge end of the cooler, making the cooler very effective and reclaiming the heat to the kiln. The standard hood made by Vulcan, suitable for either clockwise or counter-clockwise rotation of the kiln, lends itself very nicely as a large throat discharge opening for the falling clinker can be had, which enables a large volume of air to pass through the cooler.

The raw material is fed from the feeding hopper by means of two double flight screw conveyors. One short screw draws from the hopper and feeds the injecting screw, and the injecting screw runs at slightly higher speed than the other as the drawing screw runs packed, whereas, the injecting screw is loosely fed. The injecting screw runs in a cast-iron pipe, the inner end of the pipe projecting beyond the end of the screw so that the material will build up in the end of the pipe and protect the screw from direct heat.

Instead of allowing the end of the screw to float in the pipe, as is common practice and usually not very satisfactory, a tripod bearing or center-rest is provided and the bearing is centered by the three suspension or centering bolts, which makes a very easy-running conveyor, and the cast iron bushed bearing shows very satisfactory life. A productimeter is attached to the feeding screw which records the approximate tonnage fed to the kiln and also the operating time of the kiln at high speed equivalent. The feeding screw is driven by sprocket chain from the countershaft of the kiln and the speed varies directly with the speed of the kiln. The speed of the feed screw is such as to

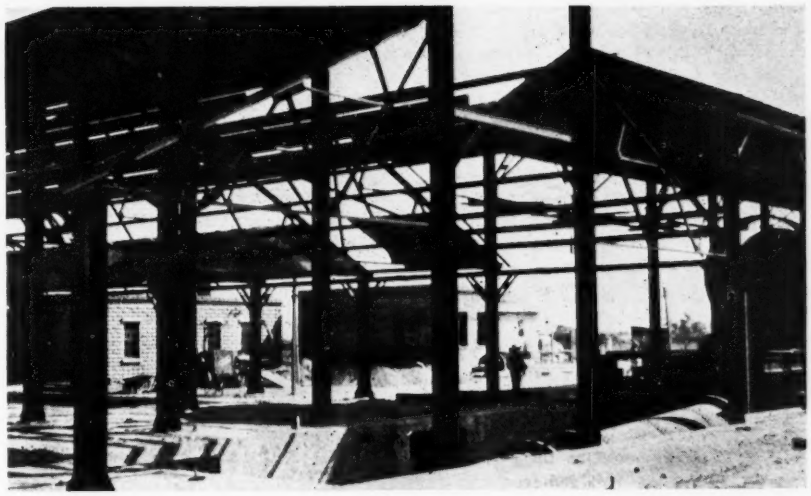
give required capacity when the kiln is running at mean speed, giving the burner adjustment above and below required kiln capacity. Thus if the kiln runs better than mean speed for the day it must produce more than its required capacity, and if it averages for the day lower than mean speed it is an indication of underproduction and may be called to the burner's attention.

The kiln is driven by a 40-hp. variable speed motor which is controlled from the burner's floor. Three crude oil burners located in triangular formation about the center of the kiln are used, the oil pressure maintained at 70 lb., and steam used to atomize and super-heat the oil at the burners. A Niagara meter records the daily fuel consumption. The first 40 ft. from the discharge end of the kiln is lined with 9-in. Harbinson-Walker blocks, and the remainder with 6-in. blocks. One ring of 16-in. blocks at the feed end prevents the raw material from flooding back into the stack chamber. A 6-in. slow-moving screw conveyor reclaims the dust from the stack chamber and returns it to the elevator feeding the feed hopper of the kiln.

The 6x50-ft. cooler is provided with a screen section of perforated plate on the discharge end which retains all clinker not passing the 1¾-in. perforations, should there be any. The first 12 ft. of the feed end of the cooler is lined with cast iron liner-lifters and ¾-in. air space is provided between the shell and liners. The cast iron lining not alone protects the shell from heat and wear but also serves to break down the clinker and very few large clinkers reach the screen on the discharge end. No water is used in the cooler, as is frequently done on some installations.

The cooled clinker is elevated and discharged into either of two rocker-dump steel cars of 40 cu. ft. capacity, which are pushed out over double track overhead extending full length of the clinker building and dumped at any point along the storage. The clinker storage building is 130 ft. long and 60 ft. wide and covered with a roof. Two tunnels suitably located for reclaiming the maximum amount without hand handling extend full length of the storage. Each tunnel is equipped with seven disc extractors and a 16-in. flat belt conveyor. All 14 disc extractors run as a battery and the two 16-in. belt conveyors discharge onto an 18-in. flat belt running at right angles, delivering the clinker to the elevator feeding the hopper over the ball mill. The extractors run at fixed speed and the motor driving the extractors and the motor driving the belt conveyors are controlled from the operator's floor at the ball mill.

By drawing clinker from 14 different parts of the storage a blending of 14 to 1 is made and the clinker is made uniform in size, grinding requirements, and chemical composition and the effect is equivalent to a 14-kiln installation. The storage is sufficient that the clinker gets considerable age before reaching the grinders and automatically the oldest clinker reaches the grinders first. Under normal operating conditions, with the storage well filled no labor is required in this department, excepting one man moving cars who also acts as clinker inspector, reports observations and number of cars delivered from kiln to storage each day from which the tonnage is estimated.



The clinker storage building extends at right angles to the kiln. The laboratory and switch board room can be seen on the other side of the clinker building

The transformers and switch room for controlling the electric power

This shows the screen on the end of the cooler. The pipe into the end of the cooler was at first used for adding moisture to the clinker but has been abandoned

Final Grinding and Packing

Clinker is delivered to the hopper over the No. 8 Allis-Chalmers ball mill, as previously explained. A small gypsum hopper is located at one side of the clinker hopper, having a capacity of one day run. As clinker is not reclaimed continuously, the clinker elevator is used to refill the gypsum hopper once each day, a two-way spout having been provided at the discharge of the elevator. The ball mill is charged with 4500 lb. of assorted steel balls and is fitted with 16 mesh .025 wire cloth. As there are 10 screen sections to the set, different combinations of wire cloth may be used for adjusting fineness to required capacity.

The first lot of cement ready for motor truck delivery. The writer is doing a little advertising of both himself and the cement

A battery of two feed tables proportions and feeds the clinker and gypsum to the mill. The amount of the feed is varied when desired by means of a Moore and White speed change driven from the counter-shaft of the ball mill. Varying the speed of the feeders in this case does not have marked effect in changing the proportions as was found on the raw materials. The product from the ball mill is delivered to hoppers over the two tube mills, which are 5x22 ft. Allis-Chalmers mills, lined with corrugated chilled lining and each charged with 13,000 lb. of 1¼-in. concavex balls, this not being a proper volume charge, but is all the weight the mills were designed to carry.

The clinker grinding department runs as a unit, driven from lineshaft, which is driven by a three-bearing, 400 hp. slip ring motor, equipped with a 16-1-½-in. English system individual rope drive, using C. W. Hunt Co. ropes made up with their couplers, which make it possible to adjust all ropes for equal tension. Both the tube mills and the ball mill are fitted with Plamondon clutches, so that any mill may be cut off at any time. However, the work has been distributed or balanced between ball mill and tube mills so that all mills work simultaneously with the view of properly loading the motor for better efficiency. The finished cement is delivered by screw conveyor to the cement storage.

The cement from the tube mills is elevated and delivered by screw conveyor to the storage bins, under the center of which extends full length a tunnel, in the floor of which is a screw conveyor with grate covering. Each bin is provided with six bin gates, three on either side of the tunnel, through which the cement is fed to the screw conveyor, elevated and delivered to the hopper over a four-spout Bates bagging machine. The section of conveyor casing over the bin is perforated so that while the cement filters through the perforations, any bolts, nuts or tramp iron will carry over and out the end of the casing and avoid any interruption from iron getting into the packing machine. The packing machine is elevated so that the sacks falling from the packer are chuted into the car and are piled by hand. Inside of each car a card is tacked showing how the sacks are piled and requesting the customer to count the contents before unloading, which avoids complaints of shortage.

Power for Plant Operation

The plant is electric driven throughout and each department of the plant is supplied by individual circuit through underground conduit. Each circuit panel is fitted with ammeter and recording wattmeter and a record is made daily of power consumption in each department. The high tension panel is fitted with power factor indicator, voltmeter, and recording wattmeter. The voltage delivered to the transformers is 4000, and three 500 KVA General Electric transformers deliver 440 voltage to the bus-bars. All panels are fitted with low voltage release oil switches. A daily record is kept of the distribution of power consumption.

Fuel oil is received in standard tank cars of 12,000 gal. capacity, and unloaded by gravity into an underground reservoir, provision having been made for heating the tank cars by steam to facilitate unloading in cool weather. A duplex pumping set is located in a pit so that the oil from the reservoir feeds by gravity to the suctions of the pump, which are provided with filters, and near which is located a steam coil for thinning the oil around the suction. The oil is further heated by a special heater in connection with the pump, the exhaust of the pump being used for this purpose. The oil main distribution consists of a 4-in. pipe, through which, extending full length, is a ⅜-in. steam heating pipe which is heated by live steam. A small boiler supplies steam for all water and oil pumps, oil heaters and for atomizing the oil.

The operating force consists of three shifts, each of 14 men, working eight hours per day, the plant having been designed to use a very limited number of higher class men rather than a greater number of the less responsible class.

How Quality Is Kept High

While the finished cement is ground considerably finer than standard specifications require, greater importance is given to the thorough preparation of the raw materials, care being taken to keep the raw material mix chemically uniform and very finely ground, the effects of which are manifested in the behavior of the kiln. A review of the foregoing will show that each of the two materials as delivered to the driers is the equivalent of a mixture or blending of products from nine different crushing plants working on limestone and nine plants working on shale. The raw mix as delivered to the kiln is equivalent to product from six different raw grinding mills. The clinker as delivered to the clinker grinding room is equivalent to the blended product from 14 different kilns. The cement as delivered to the cement storage is equivalent to the blended product from 28 different kilns and the cement as packed, if drawn from one bin only, is equivalent to the blended product of 168 kilns.

The laboratory is equipped with modern equipment and latest methods are employed for sampling and testing both raw material and finished cement, the quality of which is fully up to that of either American or European cements.

How We Made Safety Work Pay

By J. Cuthbert
Assistant Superintendent, Port Colburne Plant, Canada Cement Co.

IN the middle of June, 1921, our company decided that it was time some special effort was made to reduce our accidents. Accordingly, the month of July was selected for a "No Accident Month" campaign.

Mr. Jacobson kindly came over and visited our Montreal, Belleville and Port Colborne plants, giving an instructive and inspiring address at each plant. We—at any rate at plant No. 8, Port Colborne,—did not have any experience in any of the peculiar situations arising in accident prevention work so that we may claim to have started from the bottom of the ladder. As a matter of fact, plant No. 8 had the worst record of any of the plants of the Canada Cement Co.

A Bad Record to Start

There was no tangible reason why our record should have been so bad. The conditions in this plant were not more dangerous than at any of the other plants. We were making guards all the time and posting the National Safety Council bulletins, but we were only doing it automatically because we were supposed to do these things anyhow. We were not putting any personal touch into the matter. Nothing in the way of trying to arouse any enthusiasm toward accident prevention had been attempted. We were paying more attention to production and building up the mechanical condition of the plant than we were to the human condition of the plant, if it can be called that. The following record of accidents at our plant shows exactly our condition, and the record speaks for itself:

In 1920, January 1 to December 31, we had 48 lost time accidents, 22 no lost time accidents, making a total of 70. Two of these were fatal accidents. Days lost, 906.

In 1921, January 1 to June 30, we had 47 lost time accidents, 25 no lost time accidents, a total of 72. Days lost, 500.

These were the facts and we started out to better ourselves.

We now come to the stage where we had our first organization meeting, on June 17, 1921. The meeting consisted of L. M. McDonald, superintendent, as chairman; myself, assistant superintendent, as secretary; and the sixteen foremen of the plant as members. A central committee composed of superintendent, assistant superintendent, the foreman of machine shop, and the foreman of repairs, was elected.

The objects of the campaign were fully explained and the full co-operation of all the foremen earnestly solicited. The meeting was also addressed by Mr. Cam, our electrical engineer from Montreal, who was to take charge of directing of the campaigns in the different plants, and give as much publicity as possible to the work.

90 Per Cent Education; 10 Per Cent Guards

Our next step was to analyze all the accidents from 1920 to date, both by departments and cause, and have them all typed by departments, giving the name of injured, injury, date, cause and foreman's name. These were given to each member to digest and then on the following meetings they were fully discussed and, needless to say, it was discovered that only a few accidents could have been prevented by guards.

SMALLER compensation bills, lower insurance rates, less time lost, increased production, greater contentment, and a more effective working force are only a few of the advantages that follow an active and enthusiastic campaign for safety. Every quarry, pit, and plant can benefit from increased efforts to reduce the hazards of the industry. Serious difficulties, however, obstruct every safety campaign, and this frank account of these difficulties and how they were overcome, as told by the author at the recent National Safety Congress, will help every manager who wishes to reap the benefits which follow any sincere effort to reduce accidents.

From this analysis everything pointed to the fact that our campaign would have to consist of 90 per cent education, working up interest in safety work. A suggestion box was installed, and the suggestions received consisted of doing some work, making up a guard here, changing a platform there, putting on a new roof, getting some new chain blocks all along this line.

In order to finish some of this work four men were detailed to the making of guards and similar work so as to prove to the workmen that we were sincere in our efforts.

We held regular meetings every week. Free and open discussion on plant conditions was invited, the members were encouraged to speak freely and without fear of offending anyone, whether it might be the superintendent, assistant superintendent, or any of the foremen or men, and in this way a good many unsafe places and dangerous practices were discovered and brought to light. To try to make the campaign as public as possible and get everyone talking and thinking safety, a lot of homemade bulletins in addition to the National Safety Council bulletins were used, and several new bulletin boards were installed in the most conspicuous places around the plant.

The plant was thoroughly inspected, and all the dangerous places, or as many as could be discovered, were carefully noted. The work of rectifying these places was carefully planned and systematically carried out. Each department foreman was also encouraged to go ahead and make up guards, using the operating and repair men at their disposal at times when they were not rushed with any work. In this way a great deal of useful work was accomplished.

No Progress So Far

You will now see by the following record for July, August and September, the first three months of our campaign, that we were not making any progress in accident prevention work.

During these three months we had 12 lost time accidents and 10 no lost time accidents, a total of 22 for three months. Days lost, 245.

We were not satisfied. We had to do better than this. We were not getting results. Numerous guards were being made, but we were not arousing any enthusiasm in the average man. We were only reaching the foremen.

We decided to try another scheme. The plant was divided up into sections, each foreman to have a committee of his own and to act as chairman. A schedule of weekly meetings was arranged and a secretary recorded the proceedings. A meeting of the combined committees was to be held every two weeks, and the men serving on these committees were to change every three months. The total number serving on the safety committee by this method was raised from 16 to 50. Our idea was that if you can get the man interested, gain his confidence, get him to talk, you can often explain away difficulties which really in some cases exist only in his mind, and you can also get an idea as to how you can overcome some little dangerous practice which you yourself sometimes have been the means of making. Through trying to

overcome one danger you may have made another. If you do not encourage the man to express himself, you do not find these things out until an accident has happened, or you happen to drop in on him at some time when he was not expecting you.

I personally attended all these small committee meetings to start them off for the first time in the beginning of October, 1921, giving a general talk, explaining our ideals to them, encouraging them to show initiative and take a personal pride in the plant and its record. Each meeting was to last about 30 min.

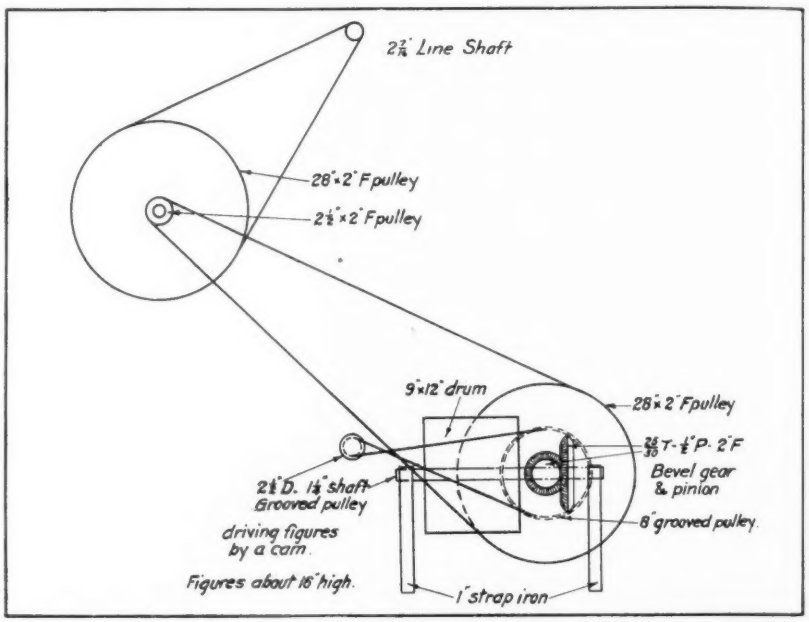
It had not been my intention to attend these small committee meetings after the first time, but to wait and see how the idea developed. I am sorry to say that by the end of the month the interest in them had fallen to a very low ebb. Now, as I had been the originator of the idea, I was not going to see them die for lack of interest, so I made up my mind that I would attend them all for a month and try it out. This meant that I attended four safety committee meetings for the first four days of each week, and also the combined committee meetings every second week. I tried this out for one month, and I must say that however much of an enthusiast I may be in safety work, I came to the conclusion that this method could not be kept up successfully.

It was decided then to hold a combined safety meeting every week, which was to be attended by all committees, and the foreman to have a meeting of his committee whenever he so desired, or wished to discuss anything which they desired to bring up at a regular meeting.

Results Commence to Show

At the same time we were running our safety campaign, we were also running a cleanliness campaign, and in order to try to make these weekly committee meetings interesting and attractive another idea was tried out. Each foreman was asked to visit some other department than his own, and make a written report on the conditions as he found them there, both in cleanliness and safety, and also make any suggestions that he thought would better the working conditions. These reports were handed to me the day before the weekly meeting, to give me time to digest and edit in such a way that no one could take offense. The name of the foreman making a report on another department was never divulged, so that there could not be any ill feeling.

Needless to say, the interest caused by this method was a wonderful help, both from a cleanliness and a safety standpoint. If a foreman had a report against him for some material not being cleaned up or put away into its proper place two weeks running, he would be roasted by his fellow



Experienced safety men agree that results come from education of employes which engenders enthusiasm for safety. At this plant the interest of one foreman resulted in the design and construction of the apparatus shown here which served to still further interest the men in safety. This home-made revolving bulletin board deserves to be copied

foremen, and you can rest assured that if it were at all possible, the same thing would not be reported a third time. This scheme worked wonderfully well for nearly six months. In the month of October, 1921, our fourth month of the campaign we had two or three cases of infection which ran our lost time up rather high. In the beginning of November, we built a new first-aid room, close to the office in a bright and clean place, and installed a first-class certificated nurse. There is not the slighest doubt that the introduction of the nurse, and the good work which she did, had a good deal to do with the success which we attained from this date. The month of November we really had a "No Accident Month." During December, the plant was closed down for extensive repairs and alterations, and we really expected to have

some trouble in spite of the hard work which had been done to guard against possible accidents. We were distinctly fortunate in having only one case, that of a man slipping on a scaffold 4 ft. from the ground and slightly spraining his left arm. He lost one day.

The total accidents for October, November and December amounted to 11, of which eight were lost time and three no lost time. Days lost, 181.

More Enthusiasm in the New Year

It was very encouraging to start off 1922 with a clean sheet, and everyone making resolutions to do all in their power to keep up the improvement. It is "a long lane that has no turning," and we thought that we were on the road to success. Some of the old school who were so skeptical about accidents being preventable by education were changing their minds; they were taking more pains with the new man, teaching him how to do his work, explaining what he should and should not do, showing him the safest and easiest way to work.

More ideas for homemade bulletins were coming in. In the machine shop the foreman made up a simple but ingenious machine to assist in giving publicity to the good work. The main idea of the machine is a revolving drum with the bulletins fastened to the drum, with just enough of the bulletin exposed, and running slow enough, so that a person could read it comfortably. The interest roused by this method was great; and now that the need for new and original bulletins became greater than ever, the supply was not equal to the demand, as the bulletins on this machine needed to be changed every day. Just as one man is clever enough to think out the idea, another man is discovered clever enough to supply the material to keep the bulletins going.

Looking after the tool-crib and stores at night time, we had a bright, intelligent young man who had been unfortunate some years ago in meeting with a serious accident while working with one of the telephone companies, in which he lost his right leg. Conversation with him proved him to be a safety enthusiast, and on being asked how he would like to undertake to assist in what we now looked on as a great help in our educational work, he was only too pleased to have the opportunity to assist in any way at all, to help to save some other chap from being as unfortunate as he was.

We had a copy of the National Safety Council slogans, published in 1917, and on this useful little book a good foundation for bulletin work was laid. In going through the different slogans, and reprinting them on large bulletins, they gradually suggested other saying and slogans to him, and the amount of local material he thought of was a revelation to most of the plant men.

The interest thus aroused was a great help in the work. In the course of two or three months we gradually got more of the men interested in the work and some good local bulletins were got out.

Now from January 1 to June 30 of this year, to show what progress we had made in this work, our record was 11 lost time accidents, six no lost time accidents, total 17. Days lost, 145.

Considering that five of these accidents happened on the same day, and that two of them were fatal, we had every reason to feel optimistic. We went through February without a lost time accident. In April we had a "No Accident Month" not even a minor accident which required a doctor.

From March 16 to May 20, 64 days, we did not have an accident and then an unfortunate thing happened. We hired a team to do some extra cleaning up for us for a couple of weeks and a day or two before we were finished with it, we sent the owner down to the town to do some work for us, and on his way home his horses became startled and ran away, throwing him off the wagon and breaking his leg. I mention this case because I want to show how much interest was taken in the plant by this accident.

How the Men Displayed Interest

The plant is divided into departments for accident prevention. We have a system whereby when a department head goes one month without an accident he receives a star; if he goes three months he receives one red star, and if he goes six months he receives two red stars, and so on. In conjunction with this system of stars for "No Accident Month" by departments, another system was adopted, a penalty system whereby each department is penalized for accidents according to the number of men, the hazards, etc. The interest aroused by this metohd is keen, as I will show by two examples. These systems were introduced in May and made retroactive to January 1.

Take the case of the teamster with the broken leg. He was under the jurisdiction of the yard foreman in cleaning up the yard, but on the day of the accident this teamster was sent to the ball ground to do some cleaning up, and on his way back the accident happened. Now, the yard foreman thought that as he was doing something which was for sport that all departments should help to bear the loss in points. After considerable discussion all departments agreed to share the loss in points, and also to give him his star.

Another case was then brought up which was more delicate. An oiler in the kiln-room, in pulling out a switch, burned his face and was off 14 days. In this case the kiln-room foreman claimed it was an electrical accident and that it should not be charged against the kiln building. The electrical department claimed that it was a kiln-room man and as he regularly performed this operation they had no direct control over him. The outcome of it all was that the two departments agreed to share the loss in points, but the electrical department claimed that, if they were to be partly responsible for accidents to departmental men, this increased their hazard and that their penalty in points should be lowered. This was agreed to by all.

I mention these two cases to show how much interest is taken in this work, and how each department takes enough pride in its record to stand up and fight for what is considered justice.

The main point in our whole campaign has been to keep the workers interested and to arouse their enthusiasm. That we have succeeded to a certain extent may be judged by the results.

Taken by periods our record is as follows:

	Man-hours (100,000)	Accidents	Acc. Frequency
January to June, 1921....	4.60	51	11.1
July to December, 1921..	4.24	20	4.7
January to June, 1922....	3.67	11	2.84

While our accident record was improving our plant was becoming cleaner and our production increased. Indeed, I may claim that this year has been our banner year in this respect.

Recent I. C. C. Decisions

RATES on stone from Falling Springs, Ill., to other points within the East St. Louis switching district, during federal control, have been condemned as unreasonable and reparation awarded in No. 12215, East St. Louis Stone Co. vs. Director-General, Alton & Southern et al., opinion No. 7760, 69 I. C. C. 567-61. The commission said they were unreasonable to the extent they exceeded 20 cents a ton, 60,000 lb. minimum from Falling Springs to groups A. to G, inclusive, from January 1, 1918, to February 29, 1920, both inclusive. Reparation is to be made to that basis.

In a report on No. 11720, Western Brick & Supply Co. of Lincoln vs. Director-General, C. B. & Q. et al., opinion No. 7758, 69 I. C. C. 551-3, the commission condemned as unreasonable increases in rates on brick and sand, moving in the Lincoln (Neb.) switching district, between June 25, 1918, and March 2, 1919, to the extent such increases were greater than 25 per cent of the rates in effect June 24, and ordered reparation to that basis. Some of the movements were for distances as short as 100 yds., while others involved hauls as great as 6.5 miles, all, however, within the limits of the Lincoln switching district. The charges, prior to June 25, 1918, were from $3 to $8 per car. In March, 1919, the rates were cut so as to carry only an increase of 25 per cent, which was the percentage of increase on rates within switching districts, even on much more valuable commodities, the commission said.

Hints and Helps for Superintendents

Increasing Dredging Pump Capacity and Prolonging Its Life

AT the plant of the Ottumwa Sand Co., Ottumwa, Iowa, a rather novel method is employed for increasing the capacity of a dredging pump by providing a stream of water at the cutter-head or suction end of the pump, and at the same time prolonging the life of the dredging pump by injecting a constant stream of water in the stuffing-gland.

For dredging sand from the Des Moines river this company uses an 8-in. American Manganese Steel Co. pump belt-connected to a 150-h.p. motor. The pump operates against a head of 700 ft., and 180 lb. pressure. When the pump was first installed it was found that they could only dredge to a depth of 10 ft. or so, due to the fact that the cutter-head proved very ineffective. It was stationary and there was no agitating device, all of which limited the capacity of the pump. Besides, they experienced considerable trouble with fine sand getting into the stuffing-gland, which shortened the life of impellor shaft considerably.

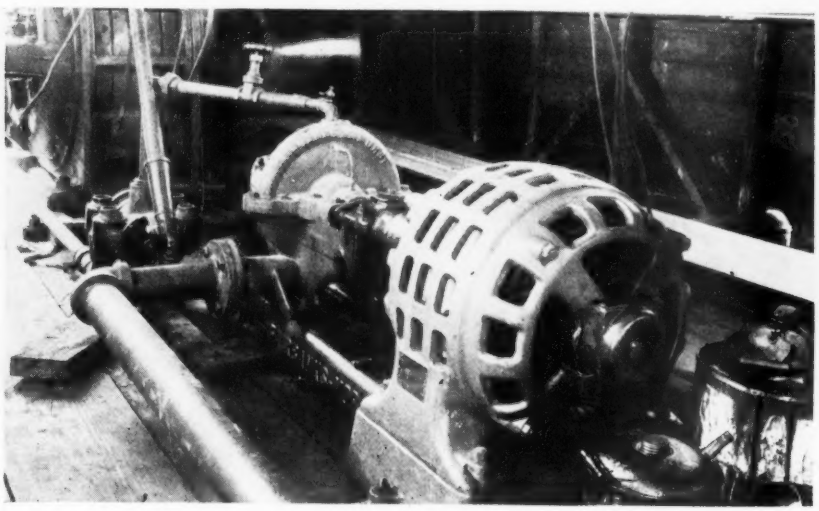
Dredge and pontoon pipe line discharge to land screening plant. The dredge is built on two steel pontoons and is supported by I-beams. The whole thing is portable and is taken apart and docked during the freezing period

In casting around for a solution to their problem, they hit upon the following: A 3-in. Fairbanks-Morse centrifugal pump direct-connected to a 20-hp. motor was installed on the dredge. The suction nozzle of this pump was placed on the opposite side of the dredge from where the suction nozzle of the 8-in. pump was located. The discharge line of the 3-in. pump was run right along the suction nozzle of the 8-in. pump, discharging right at the cutter-head.

The pressure on the small pump is in the neighborhood of 100 lb., and this force is sufficient to so thoroughly agitate the material at the cutter-head, that it is now possible for the company to move its dredge to locations that were formerly abandoned as being pumped out, and get material for an extra 4 or 7 ft. Besides, the agitating action of the smaller pump has been so thorough that it actually increased the capacity of the dredging pump 50 per cent.

Where the discharge line of the small pump passed the dredging pump, it was tapped with a small pipe line, which led directly to the stuffing-gland of the dredging pump.

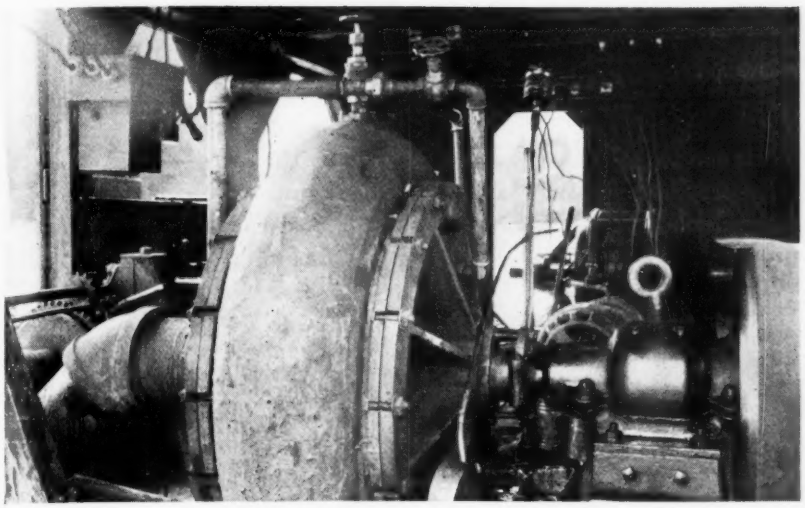
This arrangement has two advantages; one, the 3-in. pump is used to prime the 8-in.; the constant injection of water into the stuffing-gland, has formed a water-cell, which prevents fine sand from getting into the gland and doing heavy damage to the impellor shaft.



This 3-in. centrifugal pump is direct-connected to a 20-hp. motor and serves as an agitator for the cutter-head; as a primer for the large dredging pump and as a water seal against sand in the large pump

Two pontoons and an A-frame support the suction nozzle and cutter-head of the 8-in. pump. The discharge from the 3-in. pump is attached alongside the suction pipe of the larger pipe

The small 3-in. pump is primed with a hand diaphragm pump, and since its installation the company has kept the larger pump in operation for two years and has not replaced the shell or had any



Close view of the 8-in. dredging pump showing the discharge line from the small pipe entering the stuffing-gland

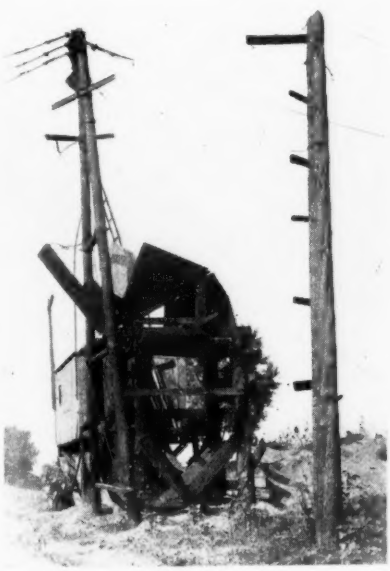
trouble whatsoever. Owen Adamson is superintendent at the Ottumwa Sand Co.

Homemade Mast for Dragline Cableway

MAKING use of those things that are ordinarily thrown away in a plant, seems to have proven very profitable at the plant of the Ottumwa Sand Co., Ottumwa, Iowa.

During the winter season this plant does not operate, and consequently must fill its orders from ground storage. For this a dragline cableway installation is used.

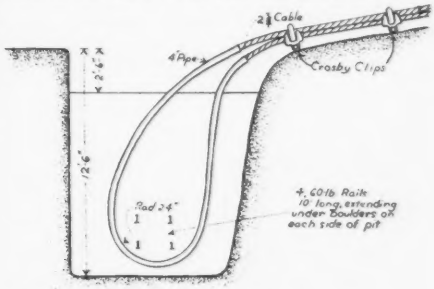
The mast for this cableway is a homemade affair, and was constructed almost entirely of discarded 8-in. dredge pipe. The accompanying illustrations are self-explanatory. The supports and cross members are channel beams with ⅜x2½ in. iron braces. This type of mast has proved to be both economical and durable.



Side view of mast constructed of 8-in. discarded dredging pipe

Unusual Type of Guy Anchor

A METHOD of fastening 2¾-in. cable to an anchorage without sacrificing any of its strength was employed on cableways used recently in the construction of the Kern Canyon plant of the San Joaquin Light and Power Corp. near Bakersfield, Cal., and described in the *Engineering News-Record*. When the concrete anchorage was being cast, there was imbedded in it a 4-in. pipe bent in the form of a loop with both ends projecting on top of the anchorage, the minimum radius being about 2 ft., as shown in the accompanying drawing. When the concrete had hardened the end of the cable to be anchored was welded to the end of a ½-in. cable, which was passed through the pipe and used to pull the main cable through. The end of the cable was then made fast with five Crosby clips 30 in. apart. The pipe was filled with grease before the main cable was pulled through. This made it easy to get the cable in and out, and, when waste was stuffed in the ends of the pipe, also prevented rusting. After the completion of the work the cable was easily removed and its entire length salvaged.



60-lb. rails, a 4-in. pipe, and some concrete made this guy anchor that many quarry operators can copy

Sand and Gravel First

MODERN buildings of steel and concrete, if analyzed, often depend more on other products than the steel and cement of which they are so widely proclaimed to be made.

In Dallas, for example, the Magnolia building which was recently completed contains more sand and gravel than any other product. The figures recently compiled show that 297 carloads of sand and 229 carloads of gravel went into the structure. The steel used amounted to only 183 carloads, while limestone came next at 140 carloads. Crushed rock and trap rock amounted to 8 carloads. There were 24 carloads of hydrated lime and 113 carloads of cement used.

Homemade mast for dragline cableway which loads sand from gravel storage

The Outlook for Cars

Equally vital in importance to all rock products shippers is the information in the carefully prepared summary of the rail situation which appears in the latest supplement to the National Sand and Gravel Bulletin, reproduced below with the association's permission

IT is very important to note that the Interstate Commerce Commission has today (August 30) adopted the policy of refusing car loadings of sand, gravel and stone in direction of mines. The national association's formal hearing, discussed later, will be held soon. On August 25 the Washington office sent out a request to members for weekly reports as to car supply at their plants. It is vitally necessary that this be complied with, inasmuch as this information will be essential in preparing data for appearances before the commission and senatorial committees. The commission is determined that nothing shall interfere with the movement of coal. Personally, we think more coal will be loaded than can possibly be moved.

The Picture Is Not Bright

The industrial picture is a gloomy one and producers will have increasingly difficult times until the strikes are settled and our old friend Normalcy settles down for a long stay.

The government admits the strikes have reached a critical stage. The President is extremely anxious to have certain extraordinary powers given him. The government is authority for the statement that thousands of loaded coal cars have been tampered with, must be unloaded and repaired. The long-delayed report of the Interstate Commerce Commission as to the condition of railroad equipment states that more than half the locomotives examined are in bad order—undoubtedly one-third of the total number are out of commission—and disquieting rumors of sabotage become more insistent. Passenger, mail and certain freight service will undoubtedly be curtailed and every ounce of energy will be devoted to moving coal, coal, coal! Keeping these facts in mind, producers of sand, gravel and stone will prepare for the worst, remembering that all industry—not this one alone—is being sadly and unnecessarily hurt.

The Car Supply Outlook

As we predicted in Bulletin Supplement No. 12 of August 17, renewed activity in the union fields has had the effect of further restricting the number of cars available for loading sand, gravel and stone. It seems inevitable that this condition will be even more aggravated during the course of the next three or four weeks and that producers located in the central territory may suffer practically a complete paralysis of their operations.

However, the old saying that "It's an ill wind that blows nobody good" seems to have application here. Reports which we have received from members located in southern territory indicate that car supply in that section has begun to improve. This is a direct consequence of the removal of the strain on railroads serving the non-union coal fields. As the union mines gradually return to normal output, the former efforts of the American Railway Association and the Interstate Commerce Commission to concentrate open-top equipment in transporting coal from non-union fields will be abandoned. This necessarily means, of course, that producers with plants located on the Norfolk & Western, Chesapeake & Ohio, Louisville & Nashville, and the Southern should receive a fair supply of cars.

THREE VITAL QUESTIONS

Will the car shortage grow?
What about more cars?
Can more cars be obtained?

The editor of the Bulletin, Mr. Barrows, has presented a picture that is far from bright. He believes that until our old friend Normalcy settles down for a long stay, producers will have increasingly difficult times.

Over-Production of Coal a Possibility

If the present priority orders remain in effect, there would seem to be a possibility of an over-production in coal within the course of six weeks. This very condition was brought about by the priority orders of 1920 when we had another so-called coal shortage. A review of the report of the U. S. Senate Committee on Reconstruction covering the outrage which was perpetrated on the country that year reveals the following significant statement:

"A review of the year shows that no coal shortage actually existed, and that the country produced 556,563,000 tons of bituminous coal as compared with 458,063,000 tons during 1919. *In spite of* the strikes and *priority orders,* which tend to decrease tonnage movements, the railroads carried more tonnage of all commodities, building materials excepted, in 1920 than in any previous year. So there was no actual coal transportation shortage or coal shortage."

We commend these facts and figures to the attention of those who claim that the Interstate Commerce Commission filled the role of protecting the people from coal famine during the 1920 episode.

Hearing of the Associated General Contractors

On August 25, Division 5 of the Interstate Commerce Commission heard the testimony of the Associated General Contractors with regard to the provisions of Service Order 23. The sum and substance of the petition was that Class 5 should be abolished or modified to put the construction industry on a parity as regards car supply with consumers of coal who would come under the provisions of Class 5. However, it has been pointed out by Commissioner Aitchison, in conference with President Dann and also with the Association of State Highway Officials, that at present there is absolutely no coal moving under this class. In view of that fact, it can be readily observed that even if the commission did accede to the request of the A. G. C., it would not result in placing a single additional car at the disposal of the sand, gravel and stone industry. This was the basis of the national association's decision not to actively participate in the hearing on August 25, although we were informally represented.

In this connection it is well to point out that the association was conversant with the fact that the latest available reports on August 25 indicated that the sand, gravel and stone industry, taking the country as a whole, was experiencing a 92 per cent car supply. This covered the week ended August 5, and we have developed information today which shows that for the week ended August 12 our industry was accorded an 89 per cent car supply, a decrease of 3 per cent from the preceding week.

Association Seeks Practical Relief Measures

It is undoubtedly true that cars for moving our materials will continue to get scarcer. It is the present program of the association to appear formally before the Interstate Commerce Commission within a short time and request some practical means of relieving the sand, gravel and stone industry during the emergency period. From our investigation we are convinced that greater advantage would accrue to our industry if the commission is petitioned to issue specific instructions to the carriers permitting of the loading of open-top cars with sand, gravel and stone when moving in the direction of the mines, together with authority to load cars up to 38 in. in height instead of the 36-in. restriction at present incorporated in Service Order 23. Permission to load in direction of the mines would instantly result in substantially increasing our car supply, although before it would be possible to secure such permission it would be necessary for producers to guarantee prompt loading and to arrange with their customers for prompt unloading in order that the movement of empty cars to the mines would not be unnecessarily delayed. Authority to load cars up to 38 in. would mean that the 79,000 cars which would come within this class would be available for loading materials other than coal.

Main Difficulty Is Lack of Motive Power

Information which we have gathered from the American Railway Association shows that, for the week ended August 15, the number of serviceable surplus open-top cars totaled 111,521. This emphasizes the fact that the chief problem confronting the railroads as to coal transportation is that of insufficiency of motive power, and that up until this time, at least, there has never really been a car shortage. It is quite impossible to obtain an accurate line on the present shape of locomotives. The disposition of the railroad executives to minimize and for the unions to exaggerate the condition of railroad equipment places an insurmountable obstacle in the way of ascertaining the exact situation.

Dire predictions are being made that the late fall and winter will witness the most disastrous traffic jam in the history of the country, although the truth of this is vigorously denied by the railroad executives in Eastern territory.

The fitting of motive power for active service is dependent either upon a settlement of the shopmen's strike or the replacement of the strikers by other workers. A statement issued by Eastern railroad executives declare that only 40,000 additional men are needed to bring the working force up to the full roster previous to July 1. They further announced that "It is conservative to say that in four or five weeks all the places will be filled, even though the men now on strike do not seek re-employment. With the present force working 60 hr. a week, as against the old force working 40 hr., the roads are getting more than a million man-hours of work now than they were before the strike."

Critical Situation on Baltimore & Ohio

Members with plants located on the B. & O. are suffering a drastic shortage of transportation. An embargo is in effect on this railroad against the handling of any freight with the exception of the classes mentioned in Service Order 23, covering the territory embraced by New Castle, Pa., on the north, Wheeling, W. Va., on the west and Cumberland, Md., on the east.

The B. & O. is unable to handle the coal being produced by mines which it serves. Out of the 1112 mines on the B. & O., 793 are now working. These mines require from 3000 to 4000 cars per day. Congestion of cars loaded with coal on this railroad is assuming alarming proportions, and we are informed that 1900 cars of coal are awaiting movement through Grafton, W. Va., 1800 through Wheeling, 1078 cars through Connellsville and 1611 cars through Holloway, Ohio.

Superintendent of Transportation Curren of the B. & O. has assured the association that he will make every effort to afford some measure of relief to sand, gravel and stone producers.

An Increased Tonnage Indicated

Although the sand, gravel and stone industry will be seriously crippled this year because of the commission's priority orders, it would seem that 1922 will show an increase in the movement of our materials as compared with the two preceding years. This is made evident by a comparison of the figures of car loadings of sand, gravel and stone for comparative periods of 1920, 1921 and 1922. We have compiled data which show that in a comparison of the figures for the period July 1 to August 5, the total number of cars of our materials loaded in the years mentioned are as follows: In 1920, 109,210; 1921, 182,657; 1922, 265,612. It is interesting to note that shipments of sand, gravel and stone during this period in 1922 showed an increase of approximately 150 per cent over the total for the corresponding period of 1920, although, of course, the low figure of 1920 was a direct result of the priority orders in effect at that time.

Coal Production Increases

Shipments from mines opening under the Cleveland wage agreement have already materially increased the production of bituminous coal, according to the report of the Geological Survey. An output of 6,400,000 tons for the week ended August 26, as compared with 4,300,000 tons for the preceding week, is assured. During the corresponding week of 1921, the production of bituminous coal totaled 7,750,000 tons, which indicates that production for this year is rapidly approaching normal. Production of anthracite remains practically zero.

Minimum Weights on Sand, Gravel and Crushed Stone in C. F. A. Territory

Information has been received by the Washington office that, following the action of the Trunk Line Association in New York on June 11, granting the request of the Association for reduction in the minimum weights on sand, gravel and crushed stone, Central Freight Association lines have also approved a minimum weight on sand, gravel and stone to a basis of 90 per cent of marked capacity of car to apply between points in C. F. A. territory, effective October 1. All members who now have minimum weights on basis of marked capacity of cars should follow up with their individual railroads for correction of their tariffs to the basis mentioned above.

Price Statistics

The Division of Building and Housing of the Department of Commerce has reported to us that they are meeting with excellent co-operation from most of the members to whom we recently wrote at the request of the division, asking that they supply the division with information as to their plant prices. We again urge upon all members with whom we have communicated, the desirability of promptly complying with the division's questionnaire.

If our industry is to be accurately and fairly treated in the publication of governmental statistics, it is primarily essential that full co-operation be extended to the agencies charged with the duty of collecting and disseminating such data.

International Roads Congress to Meet in Spain

WHAT promises to be the greatest conference on road improvement ever held will be convened at Seville, Spain, early next May. Thousands of delegates representing national and state governments in this country, Belgium, Canada, Australia, New Zealand, China, Holland, France, Great Britain, Italy, Holland, Sweden, Denmark, Switzerland, Czecho Slovakia, Spain, Portugal, Jugo Slovakia, Poland, Cuba, Chili, Brazil, Germany, Austria and other countries will participate.

English, French and Spanish have been adopted as the official languages. This news has just been received from the general secretary at Paris.

A Strong Plea for Modification

Sand and Gravel Association Asks Commerce Commission for Hearing on Service Orders 23 and 24

ASKING the Interstate Commerce Commission for a formal hearing on the subject, the National Association of Sand and Gravel Producers in its petition for the hearing has proposed to the commission a modification of the recent service orders which, in their present form, work serious injury to all aggregate producers and at the same time hold up important highway, building, and other construction.

The petition, signed by Alex W. Dann and T. R. Barrows, president and acting secretary, respectively, of the association, presents a strong case for modification. Following is the petition, which is dated September 1:

Gentlemen.

This petition of the National Association of Sand and Gravel Producers respectfully shows that—

1. Your petitioner is a voluntary association of persons, firms, and corporations engaged in the production and sale of sand, gravel, and crushed stone, having as one of its principal objects the promotion of this industry in every legitimate way.

2. These materials are important basic commodities, used extensively in construction work of all kinds and in the building and maintenance of highways. The business of producing sand, gravel, and crushed stone, as well as their use, is largely seasonal and materials must be moved when weather conditions will permit.

3. As a result of President Harding's Unemployment Conference, an enormous construction program was started this year for the purpose of relieving unemployment and the housing shortage. It is estimated that $3,000,000,000 has been awarded in contract for residential buildings and that housing quarters sufficient for a million families will therefore have been provided by the end of the year. An equivalent amount has been awarded for construction of business buildings and factories. On August 1, there was a total of 14,912.5 miles of Federal-Aid roads under construction which on that date were 56 per cent completed. In addition, almost all states have entered upon large programs for the building of state and county roads. It has been impossible to estimate the total value of contracts for sewers, reservoirs, buildings and other public projects now in course of construction.

4. These projects furnish employment for several million men, including those engaged in the production of necessary materials. The continuance of this enormous work is extremely vital to these men and those dependent upon them for support. Many of these projects have reached a point where their completion this year is necessary to avoid serious financial loss.

5. Service Orders Nos. 23 and 24 and amendments thereto give priority to coal in the use of all transportation facilities and open-top cars for essential and non-essential uses without distinction and deny the use of open-top cars for the loading of sand, gravel, and crushed stone until coal mines have received 100 per cent car supply, which discriminates against our industry and the users of our materials.

A Great Transportation Waste

6. The stringent application of these orders, in not permitting use of open-top cars for shipments of sand, gravel, and crushed stone in the direction of coal mines, and in not permitting their use in cases where such cars may be furnished by railroads without retarding the production of coal, is responsible for a great transportation waste and is a serious hardship on other users of open-top cars.

Your petitioner appreciates the difficulties confronting your honorable body in the exercise of its duties so that no one industry will suffer any undue hardships and therefore wish to present for your consideration a recommendation for the following modifications to Service Orders Nos. 23 and 24:

1. After essential requirements, such as are covered by Classes 1 and 2 of Amendment No. 4 to Service Order No. 23, have been taken care of, available open-top cars should be distributed on an equal basis to all shippers requiring such cars for transportation of their materials. Also that no priority be given in the transportation of coal for non-essential uses in the territory covered by Service Order No. 24.

2. That coal cars may be used in transporting sand, gravel, and stone in the direction of the mine or mines to be supplied, on the return movement, after the discharge of the coal lading thereof, upon a route not materially out of line and to points not beyond such mine or mines.

3. That provision be made that an embargo be placed against any consignee using such coal cars who fails to unload the same within 24 hours after such placement.

Your petitioner respectfully prays that producers of sand, gravel, and crushed stone and others interested be given an early opportunity to appear before your honorable body in support of this petition as well as to present requests for such other modifications in Service Orders Nos. 23 and 24 as circumstances may warrant at the time of the hearing.

The Crushed Stone Association Acts

IN an effort to secure a modification of existing car priority orders, W. Scott Eames, president of the National Crushed Stone Association, and Ernest T. Trigg, president of the National Federation of Construction Industries, Philadelphia, will confer with Secretary of Commerce Hoover Monday, September 11, at Washington to arrange if possible a meeting at Washington of representatives of construction industries and ask for the modification of Service Order 23.

The seriousness of the situation is indicated in the following telegrams and letters received during the past few days by the National Crushed Stone Association:

C. A. Freiberg, Buffalo Cement Co., Buffalo, N. Y., wires as follows: "Railroads at Buffalo received orders to rush all open-top equipment to mines. This is serious and hit crushed stone producers hard. Suggest you call meeting of producers at Washington at once to get priority to load equipment for mine movement."

"Railroads Do Their Best"

John Rice, General Crushed Stone Co., Easton, Pa., says: "I think railroads will make extraordinary effort to do the best they can to all industries, simply to avoid criticism that failure to supply cars is due to their own strike and, however much truth there may be in the fact of their cars being withdrawn for coal service, I believe so far as is humanly possible they will do what they can to protect all industry in their own interests as because of any superior power telling them what they must do. I am, of course, willing to go along with the majority in any efforts they choose to undertake."

The Lehigh Stone Co., Kankakee, Ill., wires as follows: "What is being done to overcome Order 23?"

From Mr. Boxley, Roanoke, Va.: "Norfolk & Western says there will be no relief for us until Order 23 is modified. Have a wire from Eames asking me to meet him at Willard Hotel, Washington, Monday. Will you be there?"

From Mr. Freiberg of Buffalo: "Following telegram just received from M. J. Gormley, Car Service Division, Interstate Commerce Commission, Washington: 'Fully appreciate conditions outlined in your message about car supply for crushed stone loading, but the coal demands due to the shut down of a large portion of the mines for five months are so extremely

serious that we cannot see our way clear to recommend any modification of Service Order 23 until urgent demands for coal are more nearly met.'"

At President Eames' suggestion, A. P. Sandles was in Washington September 1 and 2. Acting Chairman Aitchison of the commission stated: "Shipping service conditions will grow worse and may become more serious than during war time. When the question arises whether the railroads shall ship stone to build railroads, etc., or ship coal to water and light plants and to other public utilities, there is only one answer to be made and that is 'ship coal.'" There are thousands of miles of closed roads and streets uncompleted, and will remain so during winter, if Order 23 is not modified.

Mr. Roth is Service Director of Interstate Commerce Commission. He was gloomy and had very little encouragement to offer. He said conditions were likely to grow worse. Interstate Commerce Commission has exempted 104,000 open-top gondolas with sides of 42 in. and under from Order 23. These cars are free for use in moving stone.

Forward or Backward for the Lime Industry?

IN special convention at Chicago on September 20 and 21, lime producers will consider "taking final action on the plan which provides for greatly increasing and enlarging the educational and promotional work of the association." This is the purpose, according to the announcement, of the second meeting in 1922 of the National Lime Association.

"Undoubtedly," says a recent letter from Dr. M. E. Holmes, acting secretary and general manager during the absence on a country-wide trip of inspection of W. R. Phillips, "this is the most critical time in the lime industry and this is the most important meeting ever held in the interests of lime manufacture. It has been recognized for some time that the association has not been doing enough field work whereby the representatives of the lime industry and of the consuming industries are brought into personal contact. After three or four years of intensive work the association is well equipped with technical ammunition.

"The industry will decide at the Chicago convention upon the means of getting this information across in the most effective way. The plan to be presented to the convention provides for expanding the field work to about seven times its present amount, calling for a substantial increase in dues. This plan is based upon a very careful analysis of the condition of the lime industry by W. R. Phillips, general manager of the association, which very clearly shows that the industry is not making the progress it should primarily because of an inadequate amount of field work and well applied publicity. With very few exceptions, this plan of developing and enlarging the work of the association has met with the hearty approval of the manufacturers to whom it has been possible to present it in detail.

"The Chicago convention will give every manufacturer in the country an opportunity to share in the development and authorization and alteration of the activities of the association for the future. No manufacturer can afford to be absent either from the point of view of his own personal interests or that of the industry as a whole."

Charles Warner, president of the association, outlines the situation and the purposes of the special convention in the following letter:

"In my judgment, no more important step has been taken in behalf of the energetic development of the use of lime products so that all of us may benefit by larger tonnages than that contemplated in the next step forward to be presented to this special convention.

"We have reached a point in our association work where we will either go forward or backward.

"A large number of valuable and convincing facts, for the promition of the broader use of lime products, have been developed by the work of our association in the last three or four years. It is now a question for the association to decide whether or not we will pursue a more intensive and extensive course, with which to place these facts before the engineers, architects, industrial chemists and agriculturists by the personal effort of a much larger field force and the institution of a well-applied publicity.

"Other industries have successfully and profitably increased their tonnages, due to a large extent to these modern methods, but the lime industry of the present can be regarded as one that has not kept pace with those industries which have supplied a reasonable amount of funds for necessary trade development.

"To my mind, this special convention of the National Lime Association, to be held in Chicago, September 20-21, will largely settle the destiny of the lime industry. The presence of every manufacturer is urgently needed."

The convention will be held at the Hotel Sherman, and the detailed program follows:

WEDNESDAY, SEPTEMBER 20, 1922

11:00 A.M. Directors' Meeting
12:30 P.M. Luncheon (with Speaker)
1:30 P.M. Convention Called to Order
Opening Address, with Presentation of the Plan for the Development of Association Work ..... President Warner
Report on Progress of Plan to Date..... .....W. R. Phillips, General Manager
Discussion, General
Action of Convention on Plan

THURSDAY, SEPTEMBER 21, 1922

10:00 A.M. Application of Plan..President Warner
10:15 A.M. Discussion

10:30 A.M. The convention will turn to the consideration of the promotional requirements and possibilities of the different districts.

The directors of each district have been requested to submit a short written report before the convention covering their general experience in their districts respecting tonnages, which in the outlook for business seem apparent, and which are possible from the enlargement of the direct field sales work. These written statements are to discuss specifically and separately the general situation affecting the three lime markets, viz., agricultural, construction, and chemical.

These statements, together with the discussion of them, will form a basis for important consideration in the allocation of promotional effort by the enlarged National Lime Association, and should set forth clearly reasons for opportunities claimed.

Each district will be given 15 minutes for presentation and discussion of its claims. There will be a luncheon at 12:30 and at 1:30 the continuation of district reports on requirements and possibilities. At 3:30 p.m. new business, and then adjournment.

Ohio Aggregate Rates Attacked

A PETITION has been filed with the Interstate Commerce Commission by the railroads serving the state of Ohio seeking restoration of the present interstate level of rates on sand, gravel and crushed stone between points in Ohio.

The Public Utilities Commission of Ohio by its Order No. 2327, effective October 20, 1921, removed the 40 per cent increase on these commodities which had the result of reducing the rates approximately 28 per cent.

A petition for rehearing was filed with the Ohio commission by the railroads on October 13, 1921, but the petition was denied.

The Ohio railroads then filed a petition in error with the Supreme Court of Ohio on November 9, 1921, but that body, after hearing arguments, affirmed the order of the Public Utilities Commission.

The petition now filed with the Interstate Commerce Commission seeks to wipe out the reductions secured within the state on the grounds that the intrastate level established by the Ohio commission violates the provisions of section 13 and 15a of the

Interstate Commerce Act as amended February 29, 1920.

It is claimed that the lower intrastate level in Ohio discriminates against interstate commerce in favor of commerce in Ohio and produces a substantial disparity in the revenues of the railroads in that intrastate commerce in Ohio is not bearing its proper share of the net revenues of the carriers, namely 5.75 per cent on the aggregate value of their properties.

All Central States Producers May Be Affected

A decision in favor of the railroads in this proceeding will possibly result in attempts by the carriers to overthrow the reduced rates on sand, gravel and stone between points in New York and between points in Michigan. If the petition of the railroads is granted in this case, it would also preclude the possibility of further reductions in the interstate level of rates in the central states.

Under the provisions of the Transportation Act, it is not a difficult task to prove discrimination against interstate commerce if the state level of rates is lower than the interstate level.

Efforts will have to be made to substantiate the reasonableness of the present state level as well as to prove the unreasonableness of the interstate level of rates on sand, gravel and stone.

It is only by such action that a decision can be secured rejecting the petition of the carriers, and interstate shippers will probably receive direct benefits as a result thereof.

More Cars Available

A LATER bulletin from the National Association of Sand and Gravel producers, dated September 1, announces a modification to Service Order 23, which will benefit aggregate producers greatly. A part of the bulletin follows:

At a conference with Commissioner Aitchison today, arranged for the purpose of reviewing the open-top car situation as affecting producers and to make tentative plans for the holding of a formal hearing of our members, he announced that effective September 3, 1922, Service Order No. 23 would be modified, so as to permit the use of all cars with sides of 42 in. and less for sand, gravel, and stone loading.

In the original order, producers were limited to cars of less than 36 in. in height, inside measurement. There are only 62,000 cars in the latter class and this modification will increase the available supply of open-top cars by 34,000, making a total of 96,000 cars which are now exempted from coal use.

About 50 complaints covering car shortage have been handled with the authorities by the national, each one pointing out the necessity of furnishing cars for loading sand, gravel, and stone to complete important road and building projects and the representations so made have been largely responsible for this modification.

It is expected that members will be granted a hearing before the Interstate Commerce Commission during the week of September 18, at which time an opportunity will be given for a complete presentation of facts and arguments for further modification of the service orders.

Priority Orders Now Cover Country

On August 30, the Interstate Commerce Commission issued Service Order No. 24, which has the effect of extending the car service orders already in effect east of the Mississippi to embrace all the territory west of the Mississippi. After reciting that the commission has reached the decision that an emergency exists west of the Mississippi river by virtue of the inability of the carriers to properly and completely handle traffic, the order instructs the railroads to give preference and priority in the movement of the following commodities: Food for human consumption, feed for live stock, live stock, perishable products, fuel.

Section 2 of Service Order 24 provides "That to the extent any such common carrier by railroad is unable, under the existing interchange and car service rules, to return cars to its connections promptly, it shall give preference and priority in the movement, exchange, interchange and return of empty cars intended to be used for the transportation of the commodities specially designated."

Section 3 of the order suspends all rules, regulations and practices of carriers with respect to car service which might conflict with the provisions of the order.

Much pressure has been brought to bear on the commission for instituting emergency measures as regards movement of freight in the west. A large delegation from California, representing the fruit growers of that state, recently visited Washington and petitioned the commission to provide them with refrigerator equipment for moving fruit which was now threatened with destruction because of insufficiency of transportation. The delegation represented that the fruit loss of many millions of dollars if they growers of California would sustain a were not immediately provided with the necessary cars. It may be accepted that the plea of this delegation was largely responsible for the commission's action in exercising its priority powers west of the Mississippi.

A Market Place for Lime

LIME manufacturers whose product is or can be used in any of the many chemical uses will find not only educational and inspirational value in a trip to the eighth National Exposition of Chemical Industries, but they will find many chemical manufacturers who use lime and others who, perhaps, should use lime in their processes. The exposition will be held at the Grand Central Palace, New York, from September 11 to September 16.

The Chemical Exposition is an important market place where lime manufacturers can reasonably expect to get orders for large amounts of lime. Exhibits and demonstrations of products, processes, machinery and apparatus applied in the industries will be made by leading manufacturers. There is ample opportunity to gain accurate knowledge of what industries need development, how much all industry is dependent upon chemistry and see the improvements recently made in the American chemical industries.

Among the prominent speakers are: Wayne B. Wheeler, general counsel for the Anti-Saloon League and one of the best-known authorities in the United States on alcohol and prohibition legislation, who will speak on the "Attitude of the Anti-Saloon League Toward Industrial Alcohol;" and Secretary of Commerce, Herbert Hoover, the "business man of the Cabinet," who will play a part in the standardization program in an address to the Salesmen's Association of the American Chemical Industry, entitled "What Standardization Can Do for the Chemical Industry."

During the week of the exposition the program of each afternoon will be given over to various organizations and subjects. The associations that have definitely arranged to meet include the Technical Association of the Pulp and Paper Industry, the American Ceramic Society, the Technical Photographic and Microscopical Society (September 14 at 2 p. m.) and the Salesmen's Association of the American Chemical Industry. The Synthetic Organic Chemical Manufacturers' Association of the United States is also planning a meeting.

Of Interest to Quarry Operators

Each evening during the week the program has been planned to include motion pictures and illustrated talks. One of these, at least, "The Story of Heavy Excavating Machinery," should be of interest and value to all quarry and pit operators.

A Corking Safety Meeting

DELEGATES from many distant states gathered at Detroit to attend the two cement section sessions of the 11th annual Safety Congress. The congress, under the supervision of the National Safety Council, lasted from August 28 to September 1, and included five general sessions and about 50 section meetings of the 20 or more sections, in addition to luncheons, entertainment, and miscellaneous meetings.

Officers elected for the coming year are: Marcus A. Dow, New York Central Lines, New York City, president; C. B. Auel, Westinghouse Electric Co., East Pittsburgh, Pa., vice-president in charge of industrial safety; David Van Schaack, Aetna Life Insurance Co., Hartford, Conn., vice-president in charge of public safety; George T. Fonda, Fonda, Tolsted, Inc., Washington, D. C., vice-president in charge of sectional activities; L. A. DeBlois, Delaware Safety Council, Wilmington, Del., vice-president in charge of local councils; Homer Neisz, Commonwealth Edison Co., Chicago, Ill., treasurer and chairman of finance committee; W. H. Cameron, National Safety Council, Chicago, Ill., managing director and secretary.

Maj. Henry A. Reninger, of the Lehigh Portland Cement Co., was elected to the council's executive committee.

The cement section was of principal interest to men of the rock products industries, though the mining section also offered many suggestions of value to quarry operators.

Two sessions were held by the cement section, one on Tuesday presided over by A. C. Tagge, vice-president of the Canada Cement Co., Ltd., and one on Wednesday with Major Reninger as chairman. At the Tuesday morning meeting an excellent account of the development of safety work, and the valuable results obtained at the Port Colborne plant of the Canada Cement Co., Ltd., was given by J. Cuthbert. This account appears in this issue of Rock Products. At this same session H. G. Jacobson, manager of the bureau of accident prevention and insurance of the Portland Cement Association, reviewed the accident situation in the cement industry and pointed out the prospect of better records in the future. Beginning in 1911, safety work in cement plants has made good progress, and especially since 1917 accidents have steadily decreased.

Much valuable discussion followed the presentation of these two papers, as was the case in the address and demonstration of artificial respiration by S. H. Reid, of the Bureau of Safety, Chicago, at the Wednesday morning session. A discussion of electrical hazards, as well as of artificial respiration in cases of electrical shock, drowning, suffocation, and other accidents where respiration is temporarily stopped, took place.

Among those who were present at the cement section meetings, in addition to those already mentioned, are W. S. Carmichael, of the Riverside Portland Cement Co., Riverside, Calif.; George Ross, of the Missouri Portland Cement Co., St. Louis; A. Gillies, of St. Mary's Cement Co., Canada; A. A. Huck, of the Canada Cement Co., Belleville, Canada; F. H. Sass, of the Universal Portland Cement Co., Buffington, Ind.; G. C. Hugh, of the Universal Portland Cement Co., Duluth; William Moeller, of the Texas Portland Cement Co., Dallas; J. L. Geiger, of the United States Gypsum Co., New York; J. L. Faist, of the Woodville Lime Products Co. Woodville, Ohio; M. B. Wilson, of the Tidewater Portland Cement Co., Union Bridge, Md.; J. D. Josse, of the St. Louis Portland Cement Co., St. Louis, and Messrs. Morgan and Uhlman, of the Dixie Portland Cement Co.

How Freight Rates Affect Cement

SOME idea as to what freight rates may do to construction can be gained from Part III of the four-volume report recently issued by the Joint Commission of Agricultural Inquiry, created by Congress in the summer of 1921. This third volume, entitled "Transportation," is an analysis of the relationship of transportation to agriculture and industry and contains much of interest to the construction industry. Studies relating to cement, hollow tile, iron and steel, lumber, shingles and wire nails were made and what appears here includes merely the salient points of interest in the commission's findings of fact and in considerable measure stated in the words of the report.

An article in the current issue of *The Constructor* reviewing this report summarizes in the following paragraphs what the report has to say about cement and freight rates.

Cement is one of the country's "basic" commodities. Its use in building operations as a substitute for other materials has rapidly increased. Raw material is obtained in nearly every state, and distribution by motor truck and by rail is constantly growing more localized, owing to the increase in building in every community. Almost every section of the country has plants usually capable of supplying the local demand.

The production in 1921 fell short of the 1920 production by a relatively slight margin, yet, even though not the maximum production, the 1921 production was 1100 per cent greater than that of 1900. Consumption has maintained a healthy level, with the result that the present condition of the industry is prosperous in comparison with agriculture and other industries, and which primarily is due to the exceptional increase in demand during 1921 for the building of surfaced roads, and approximately 2000 per cent more portland cement found a market for road construction in 1921 than during 1913.

In its study of the freight costs from 13 representative producing points to 316 consuming points, the commission found that the average rail haul on cement in the territory of Chicago and east is approximately 150 miles and in the territory west 260 miles. The average freight cost per barrel in 1915 was $0.4504, and in 1921 $0.72, as contrasted with an average mill price in 1915 of 97 cents and in 1921 of $1.50 per barrel.

Prices held reasonably steady in 1921, due to activity in road building, and that fact has stabilized conditions in the industry; but this view, the commission says, does not afford a true picture of the effect of high prices and high transportation costs upon the home builder and the farmer. Both freight rates and prices of this commodity, it says, should follow the trend of price levels of other basic commodities; and, when the freight rates are reduced, such decrease should be reflected in the price to the consumer and not absorbed as profit by various other factors in the distribution system.

Some Bargains Here?

SEPTEMBER 15 may be bargain day for the purchasing agents of quarries and plants in the vicinity of Camp Meade, Md., if any of the large number of articles to be sold there at the War Department's surplus property sale happen to be on the list of quarry needs at the time.

At 10 a. m. on that day there will be a sale of large quantities of surplus property, including office furniture, wagons, harness and other horse equipment, tools, and materials and supplies of many kinds. Further information can be obtained by writing to the Quartermaster at Camp Meade, Md. or to the Eastern Surplus Property Control Office, Army Supply Base, Brooklyn, N. Y.

Other sales of materials during September are scheduled at Frankford Arsenal, Pa., Sept. 19; Tullytown, N. J., Sept. 20; Morgan Depot, Morgan, N. J., Sept. 21; Omaha, Neb., Sept. 21; Houston, Tex., Sept. 22; Aberdeen, Md., Sept. 25; New Orleans, La., Sept. 26; Watervliet Arsenal, N. Y., Sept. 27; Camp Devens, Mass., Sept. 28; and Norfolk, Va., Sept. 29.

Guests of Brazilian Exposition

WARREN EMLEY of the U. S. Bureau of Standards has gone to the International Exposition at Rio de Janeiro, Brazil, as representative of the Bureau of Standards. Two other Americans who are attending the same exposition are Secretary of State Charles E. Hughes and Calvin W. Rice, secretary of the American Society of Mechanical Engineers.

Selling More Roofing Slate

ROOFING slate is coming back into its own. The demand and shipments of roofing slate in July, 1922, were the greatest in several years, according to producers reporting to the National Slate Association. Many buildings and homes are being re-roofed which were roofed with temporary materials during the rush of war construction, and slate is receiving the majority of this business. The shipments of slate for roofing purposes, according to the reports from over 50 per cent of the producers, exceeded the July production by nearly 60 per cent, so that considerable inroads were made into the stock on hand as of July 1. Production in July showed considerable increase over that of June, and August promises even higher figures.

Kind of Limestone of Slight Importance

WHETHER the limestone used as a dressing for acid farm land shall be magnesian or nonmagnesian is not so important as that the amount be sufficient to supply the soil's need for lime, declares Prof. J. W. Ames, soil chemist of the Ohio Experiment Station.

Fine grouped magnesian limestone applied at the rate of 2 tons per acre every four years gave an increase for the four crops of the rotation valued at $12.40; while the increase for nonmagnesian stone was $13.33. Equivalent amounts of burnt or hydrated lime, of the two kinds, gave slightly larger increases for the grain crops but smaller gains of clover hay.

The experiment has run for seven years on silt loam soil a little above the average fertility and receiving 8 tons of manure to the acre on corn and 320 lb. of acid phosphate on the wheat. The amount of lime required will vary greatly with the type of soil, length of time under cultivation and other local factors.

Cement Sacks and Their 17,000 Miles of Cloth

IF you were the owner of a textile mill, how would you like to get an order for a strip of cotton cloth 30 in. wide and 17,000 miles long? asks the Portland Cement Association in a recent bit of publicity matter.

Of course nearly every one in the industry knows that approximately 200,000,000 cement sacks are utilized yearly by the cement plants, but expressed in terms of an order to the textile mill, the quantity is startling.

Here are more figures: Such an order would mean that more than 30,000 bales, or 15,000,000 lb., of cotton would be used in weaving the cloth; that 160 looms would be continuously busy for a whole year; that if all the sacks had to be replaced at once, it would require more than 200,000 bales of cotton to make the cloth; that 30,000,000 sacks must be provided annually. Millions of dollars are involved in the accounting for sacks returned every year.

Further, these sacks get such hard usage that they seldom make more than eight trips to and from the mills. It is a rare thing for a sack to make more than two or three round trips a year.

Who can blame the cement industry for its insistent demand that its sacks be returned in good order, and promptly?

"Much Building This Fall"

WITH the coal strike virtually settled, the only obstacle that stands in the way of better times is the railroad shopmen's strike, according to a report on general conditions issued today by the Committee on Statistics and Standards of the Chamber of Commerce of the United States. When the strikes are out of the way, a better volume of business is expected to follow.

The report further points out that "it is a year of plenty in every phase of argicultural production—staple and secondary crops, fruits and vegetables alike. There are few record breakers, but plenty and more of everything with such surplus as may be needed for export.

"There will be much building this fall, especially in the cities and large towns and in such country districts as have spare money from their crops. All interests connected with building and construction have their hands full; likewise, general road building is doing much to keep down unemployment."

More Interest in "Lime and Tuberculosis"

INTEREST in the article "Lime and Tuberculosis," which was published in the January 14, 1922, issue of ROCK PRODUCTS apparently is never going to cease. There have been a great many references made to this article, and a great many letters have been received concerning it. The latest one to be received on the subject comes from Montreal, Louis Hurtubise, a consulting engineer with the Montreal Crushed Stone Co., Ltd. Part of this letter follows:

"My attention was called to a splendid article in your issue of January 14, 1922, page 56, 'Lime and Tuberculosis.' I wish I could have 10 to 20 copies of that article. I am carrying in Canada a campaign similar to the one you are putting through and any help coming from you will be highly appreciated. Many professors and doctors fail to see anything in the contention that lime is helpful for tuberculosis. It is to convince them that they are not aware of the experience conducted in that sense, that I want to forward them copy of the article above referred to."

A Specialist in Consulting Work

OPERATORS in the rock products field will be interested to know that George Borrowman, Ph.D., who has been handling consulting research and analytical problems as a chemist, has decided to confine his work more closely to the rock products field, in

George Borrowman, Ph.D.

which field most of his experience, training and interests have lain.

Mr. Borrowman is a graduate of the school of chemistry of the University of Minnesota and has specialized along the inorganic, mineralogical and metallurgical lines. Later while on the staff of the University of Nebraska he acted as chemist for many concerns, including those interested in cement, clays, potash extraction, etc. It was during investigation of natural zeolitic minerals, especially glauconite or greensand and their industrial applications that the material known as "Borromite" developed. This is a zeolitic water softener which has been patented in almost every civilized country and licensed to manufacturers. In the U. S. the Wayne Tank and Pump Co. is the licensee and the material is now known as "Wayne Mineral" in this country. Mr. Borrowman is consulting chemist for the Wayne Tank and Pump Co.

Use of Hammer Drills for Primary Blasting

Well drill holes and dog tunnels have been discarded in recent years by many quarries in breaking ground. Mr. East here presents the case of the air hammer drill and explains its advantages

By J. E. East, Jr.
Mining Engineer, The Denver Rock Drill Mfg. Co.

DEVELOPMENT work for primary blasting in quarries formerly consisted almost entirely of well drill holes and "dog tunnels," but in recent years many of the quarries have discarded these methods of breaking ground and have installed air hammer drills for this class of work.

Drilling 16-ft. vertical holes with bottom diameter of 2 in., having same average as in other pictures, in a 10-hr. shift

The use of smaller diameter holes, spaced closer together than the well drill holes, has resulted in a better distribution of the explosives used for making the blast, and for the same or lower initial cost, a much more uniform sized product has been obtained. This has materially reduced the cost of secondary blasting as well as decreased the time lost, and reduced the danger from the continual block-holing or bull-dozing of the large rocks remaining from the former methods of breaking ground.

A comparatively recent development in air drills is the perfection of types of hammer drills capable of drilling deep, vertical holes having a sufficiently large diameter at the bottom to contain the explosive required without springing a pocket. Vertical holes are drilled from tripods or with the drills mounted on handles and held by the men, or, as in a few cases, from specially designed derrick rigs to depths of 30 ft., and in one case, to 36 ft. If the bank is higher than can be blasted with vertical holes of this depth, the toe is drilled with flat and reliever holes from tripods on the floor of the quarry. The holes usually bottom 2 in. in diameter and a sufficient footage is drilled so that the same quantity of explosives may be used in making the blast as in well drill hole blasting, generally 1 lb. of explosive to each 3 to 6 tons of rock to be broken.

Drilling 25-ft. vertical holes costing less than 12 cents per foot. These drills average from 200 to 250 ft. of hole per drill in a 10-hr. shift

Under average normal conditions of quarry operation, the well drill will drill from 40 to 60 ft. of 5⅝ in. hole per 10-hr. shift at a cost of from 40 to 70 cents per foot. The spacing of the holes varies according to the different conditions encountered, such as the height of the bank and the type of material to be broken, but for purposes of comparison may be stated as being generally 10 ft. apart and from 10 to 12 ft. from the face of the bank. This will closely approximate the actual conditions in any quarry where the bank is not over 60 ft. high.

Drilling Deep Vertical Holes

The air hammer drill used for drilling deep vertical holes must have a powerful rotation and be equipped with convenient and effective means of cleaning the holes, as they are usually drilled dry and the cuttings blown with compressed air. Model 21 Turbro drills of The Denver Rock Drill Mfg. Co., working on tripods, were observed drilling dry vertical holes 25 ft. deep having a bottom diameter of 2 in. in fairly hard limestone. The drills averaged from 200 to 250 ft. of hole per 10-hour shift per drill at a stated cost

of less than 12 cents per foot. Model 65 drills mounted on handles were drilling dry vertical holes 16 ft. deep having a bottom diameter of 2 in. and averaging 200 to 250 ft. per drill per shift of 10 hours.

At another quarry a Turbro drill mounted on a special portable derrick or frame was drilling dry vertical holes 36 ft. deep having a bottom diameter of 2 in. The drill would drill a 36-ft. hole in

Drilling 16-ft. holes in a Pennsylvania quarry averaging from 200 to 250 ft. per drill per 10-hr. shift

one hour under favorable conditions. The holes were being drilled 8 ft. apart and spaced 15 ft. back from the toe of the bank. These holes were sprung in place of loading in the barrel of the hole according to the usual custom.

At still another quarry one Dreadnought Model 65 drill supplied broken rock for a small revolving shovel engaged in making a railroad cut through a bank 18 ft. high. The holes were drilled 2 in. in diameter at the bottom, spaced 5x5 ft. and blasted without springing. Several rows of holes are blasted at each shot.

At another quarry having a bank approximately 70 ft. high Turbros were drilling holes 20 ft. deep on a series of narrow benches and the holes blasted into the quarry pit.

Small Air Drill Holes

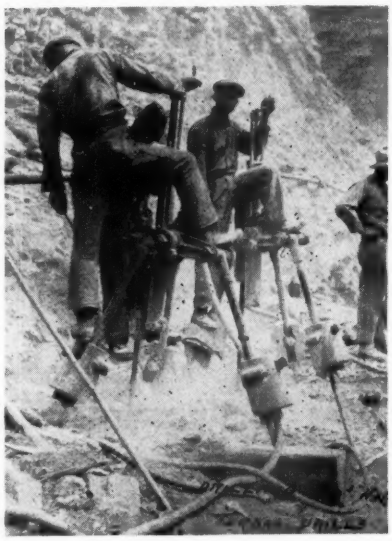
The small air drill holes are generally spaced about 4 ft. apart, with 5 ft. between the rows of holes or from the face of the bank and with the rows of holes staggered. Considerable care is taken to have the holes properly spaced and drilled at least 1 ft. below the bench level.

In blasting a very low bank—say, 15 to 25 ft. high—a cushion or buffer of broken rock from the previous blast is often allowed to remain against the toe of the bank to help confine the charge and to prevent the rock from being scattered out over the bench. The back rows of holes are generally loaded with from 10 to 15 per cent more explosives than the front row to insure a good fragmentation.

The use of air hammer drills in the development for primary blasting is more particularly applicable to those quarries having low banks as the well drill is probably without a rival as yet in drilling a high-bank quarries with faces from 75 ft. to 200 ft. high. However, the better distribution of explosives throughout the block of ground to be blasted when the small air drill holes are used for primary development, with the resultant better fragmentation of the rock, makes it seem very probable that air hammer drills will come to be much more extensively used in those quarries where the faces are up to 60 ft. high, which is the real field of the air hammer drill.

Roche Harbor Lime Co.'s Harvest Festival

TRULY, the harvest festival given annually by the Roche Harbor Lime Co. has become a fixed institution in the hearts of the people in the environs of



These Pennsylvania quarry men are drilling 20-ft. holes

Tacoma and Roche Harbor, Wash.—particularly to the employes and immediate friends of the Roche Harbor family. While this festival may look like a considerable drain upon the resources of the company, Commodore McMillin, its president, assures us that the company is repaid manyfold for its expenditure in the added loyalty and better work of all concerned.

This festival is the main means of humanizing the dusty, dry lime business and its success was evidenced in the festival given this year at Roche Harbor on July 29 to 31. A beautiful allegory, "The Fairies' Greeting," welcomed the guests with song and the recitation of poems pertinent to the occasion. There was a welcome banquet—"Bienvenue," in the words of the program—in the recreation courts of the Hotel De Haro, with a menu that would have shown Lucullus to be a piker had he been there.

And then Hope and Iva-Lou McMillin sang to the music of "Smiles" some verses likes this one:

There is lime that's good for spraying,
There is lime for smelting ore,
There is lime that's used in agriculture,
To multiply the yield at least a score;
There is lime than can be used for mortar,
There is lime for making paper, too—
But Roche Harbor lime for every purpose
Is the lime that's the best for you.

On Sunday morning, after an appetizer of hot coffee and an early visit to Fish Trap on the good ship "Calcite," there was breakfast at the hotel, with lashin's of goodies. And George Young, accompanied by Mrs. George, sang "Here Roche Harbor's hand of welcome is extended to our guests."

Later there was a salmon barbecue on a scow at McCracken Point. To give the day its proper tone, the Rev. Major of Seattle made an address. And then there was more of the joyous science of minstrelsy. In the evening came a moonlight excursion to San Juan Archipelago and a buffet luncheon, and—

We only wish we had space to tell of all the frolics and "eats" that this happy family had the next day. It would make your mouth water to even read about it.

But in its "bon voyage" from the company and its staff came the keynote of it all—

Your coming gave us pleasure,
Your leaving gives us pain;
Fond memories our only treasure
Until you come again.

Contractors Ask Rate Revision

ELEVEN road contractors, nearly all of Fargo and Grafton, N. D., have filed an application for a revision of the sand and gravel rates now in force on the Northern Pacific, the Soo and Midland Continental roads from Minnesota points to North Dakota destinations. The case has been docketed with the Interstate Commerce Commission. Request is made for "application of the Minnesota scale to North Dakota points, and removal of the undue burden placed upon interstate commerce which North Dakota cities are compelled to bear."

The complaint contends that Fargo should have the Moorhead, Minn., rate, and that the Minnesota scale should be applied to all North Dakota destinations.

Editorial Comment

What's Ahead for Lime?

Thirty years have witnessed the growth of the portland cement industry from an annual production of less than half a million tons to an output of a hundred million tons. The past 13 years have seen this industry double in production. Still further increases can be confidently expected.

During the past 13 years another industry, that of lime production, has seen no consistent growth in the total volume of production. The value of the product, because of increased prices, has tripled, but the number of producing plants is less than half and the 1920 production figures of the United States Geological Survey show a lime output only 2 per cent higher than for the year 1909. The average for the 12 years is scarcely higher than the output for either of the years mentioned.

Lime is a staple product, and without question the demand for it will continue. But without active research and study for new and better uses, and promotional work in both present and new uses, the demand is likely to fall off rather than increase. A good product plus investigation and promotion has brought remarkable results in the cement industry. Lime men have the good product; they need the investigational and promotional work to make their industry go ahead.

For the good of his business and of the industry he represents, no lime maker can afford to stay away from the coming special convention of the National Lime Association "called for taking final action on the plan which provides for greatly increasing and enlarging the educational and promotional work of the Association." Any logical plan for increasing and enlarging the activities of the association which represents the lime industry deserves the support of all who will benefit—in other words, every lime producer.

Dollars from Safety

National Safety Week has just passed, and cement manufacturers from many parts of the country gave active proof of their faith in organized safety work by gathering at Detroit to discuss among themselves at the Safety Congress the accident problems common to quarrying and cement making operations. Cement men came from California, from Canada, from Texas, and from other far off points to learn from the experience of others how time and money have been saved, costs cut and output boosted, by safety efforts which have lowered the number of accidents.

This activity of cement producers in safety work is only one of the evidences which all quarry, pit and plant operators should take as proof of the dollars and cents value of aggressive safety work in their operations. That there is a dollars and cents value—a big return on the investment—no manager who has studied the results of a comprehensive safety campaign doubts.

The advantages group themselves into three classes. First, the lower accident rate which results from safety work reduces the amount of compensation the employer has to pay. This saving is just as important when compensation insurance is carried, for as much as 40 per cent can be saved in premiums where the employer can show active safety work and a good experience record.

Fewer accidents mean fewer interruptions in operations, and the stoppage for a few minutes or a few hours of some vital part of the operation often runs into greater expense than the compensation paid for personal injuries. With safety committees and all employees on the job to prevent accidents, costly shutdowns are fewer.

The third advantage is less tangible, but perhaps even more important than the other two. A sincere effort on the part of the management to prevent personal injuries—to better the condition of the workers, in other words—shows the workers that interests of employer and employee are the same in some directions, at least. Safety work, then, is a strong influence for better industrial relations, and in many cases it is this intangible spirit of co-operation that makes success, and the lack of it that spells failure.

Safety work—not merely a few warning signs and a few mechanical guards, but an active and continuous educational campaign among employees—pays, and while its full value seldom shows directly on the books it is usually possible to point to substantial savings as a result of teaching safety to employees.

Getting More Cars

A fair fight for fair play deserves to win. Just what may be fair play in the distribution of cars in an emergency like the present one may be open to discussion, but at least it isn't reasonable to ship coal to non-essential industries while sand, gravel, and stone cannot be moved to highway and building construction jobs on which a million men are depending for a livelihood, and which are for the benefit of millions of individuals who need the highways for business purposes or the buildings for homes and places of business.

One concession has been gained from the Interstate Commerce Commission, one which adds 34,000 cars to the number available for aggregate shipments. Now the National Association of Sand and Gravel Producers is making a request for a second entirely reasonable modification of the orders, and every shipper, whether membe or not, should support the Association in this move.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.	1.30 per net ton all sizes					
Chaumont, N. Y.	1.00	.....	1.50	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.	1.50 per net ton all sizes					
Eastern Penna.	1.35	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.	.75	1.10	1.10	1.10	1.10	.....
Prospect, N. Y.	.75	1.25	1.25	1.25	1.25	.....
Walford, Pa.	.....	1.30	1.30	1.30	1.30	1.30
Western New York	1.00	1.20	1.20	1.20	1.20	1.20
CENTRAL						
Alton, Ill.	1.75	.....	1.40	1.35	1.35	.....
Buffalo, Iowa	.90	.....	1.20	1.00	1.05	1.05
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Faribault, Minn.	.....	.....	.....	.....	1.75	.....
Greencastle, Ind.	1.25	1.10	1.00	.90	.90	.90
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50
Krause, Columbia and Valmeyer, Ill.	1.40	1.35	1.35	1.35	1.20	1.20
Lannon, Wis.	.80	.....	1.00	.85	.85	.85
Mitchell, Ind.	.80	.80	.80	.80	.80	.80
Montreal, Canada	.85	1.20	1.10	1.05	1.00	.....
Montrose, Ia.	.....	1.50	1.60	1.55	1.45	1.40
River Rouge, Mich.	1.00	1.10	1.10	1.10	1.10	1.00
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Southern Illinois	1.35	1.25	1.25	1.25	1.10	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Iowa	.75	.....	1.40	1.30	1.25	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
Waukesha, Wis.	Prices include 90c freight all sizes .80 per ton					
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bromide, Okla.	.75	.....	.....	1.50	1.50	.....
Cartersville, Ga.	.....	2.00	1.40	1.25	1.25	.....
Chickamauga, Tenn.	.90@1.00	.85@1.15	.....	.75@1.00	.75@1.00	.....
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	1.00	1.30	1.40	1.25	1.15	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	2.00	2.00	2.00	1.50	1.50	1.50
Morris Spur (near Dallas) Tex.	1.00	1.25	1.25	1.25	1.25	1.00
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.20	.25	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2 20	2.00	1.80	1.50	.....
Branford, Conn.	.80	1.50	1.25	1.15	1.00	.....
Bound Brook, N. J.	2.00	2.30	1.90	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	.90@1.00	2.00@2.25	1.75@2.00	1.40@1.50	1.30@1.40	1.50
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	.....
Eastern Mass.	.60	1.85	1.60	1.50	1.50	1.50
Eastern New York	.75	1.60	1.60	1.40	1.40	1.40
Eastern Penna.	1.25	1.70	1.60	1.50	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.35@1.45	1.15@1.25	1.05	.95@1.00	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.10	2.30	2.00	1.70	1.40	.....
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.50	1.60	1.40	1.30	1.30	.....
Columbia, S. C.—Granite	.....	.....	1.75@2.00	1.75	1.60@1.75	.....
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.60	1.55	1.40	1.35	1.35
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.30	1.30
Lithonia, Ga.—Granite	1.00	2.50	2.00	1.25	1.25	1.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.50	2.00@2.50	.....	1.50
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 2.50

Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$—100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk 3.00

Hillsville, Pa. — Analysis, 96.25% $CaCO_3$—Raw ground; sacks, 4.50; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; pulverized limestone; sacks, 4.00; bulk..... 2.50

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk..... 3.00

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk.... 3.00

CENTRAL:

Alton, Ill.—Analysis, 97% $CaCO_3$, 0.1% $MgCO_3$—90% thru 100 mesh..... 6.00

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh 1.50

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh..... 1.25

Bettendorf, Ia., and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh..... 1.25

Buffalo, Ia.—90% thru 4 mesh..... 1.00

Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$—50% thru 100 mesh 1.50
90% thru 4 mesh, cu. yd..... 1.35

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh.... 1.00

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh..... 2.00

Kansas City, Mo.—50% thru 100 mesh 1.50

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh..... 1.40

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh..... 2.00

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; pulv. limestone; 70% thru 100 mesh; 60% thru 50 mesh; 100% thru 10 mesh; sacks.. 4.50
Bulk 3.00

Milltown, Ind. — Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$—40.8% thru 100 mesh, 61.2% thru 50 mesh..... 1.40@1.50

Mitchell, Ind. — Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$ — 90% thru 100 mesh 1.25

Montrose, Ia.—90% thru 100 mesh..... 1.25

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O.—90% thru 100..... 3.25@5.00
40% thru 100..... 1.75@2.00
100% thru 4..... 1.25

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ½-in. mesh..... 1.30

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 50 mesh..... .75

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh	1..0
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Chasco, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$—90% thru 100 mesh	5.00
90% thru 50 mesh	1.35
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk	4.25
SOUTHERN:	
Alderson, W. Virginia—Analysis 90% $CaCO_3$; 90% thru 50 mesh	1.75
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ — 50% thru 100 mesh	2.00
90% thru 4 mesh	1.50
Cartersville, Ga.—Analysis, 55% $CaCO_3$, 42% $MgCO_3$—all passing 10 mesh	2.00
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$—90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$—90% thru 50 mesh	1.75
Hot Springs, N. C.—50% thru 100 mesh, sacks, 4.25; bulk	3.00
Knoxville, Tenn.—90% thru 100 mesh; bulk	2.70
Ladds, Ga.—90% thru 50 mesh	2.00
Linnville Falls, N. C.—Analysis, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; 2.50 per ton bulk, 3.50 per ton mesh 200-lb. burlap; crushed limestone, ⅜ down, including dust, 1.00; 1 to ¾, 1.60; 2-in. and less	1.40
Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—X thru 20 mesh; sacks	5.00
WESTERN:	
Colton, Calif.—Analysis, 95% $CaCO_3$, 2-4% $MgCO_3$—all thru 14 mesh—bulk	4.00
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh	.50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:	
Baltimore, Md.	2.25
Berkley Springs, W. Va.	1.75@2.00
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.	5.00@10.00
Columbus, Ohio—Glass sand	1.50
Dunbar, Pa.—Damp	2.00
Falls Creek, Pa.	2.50
Hancock, Md.—Damp	1.25@1.75
Klondike and Pacific, Mo.	1.75@2.50
Mapleton, Pa.	2.00@2.25
Massillon, Ohio	3.00
Michigan City, Ind.—Glass sand	.50@ .55
Mineral Ridge, O.	2.50@2.75
Green	2.00
Montoursville, Pa.	1.75
Oregon, Ill.—Glass sand	1.25@1.75
Ottawa, Ill.	.75
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	2.50
Round Top, Md.—Dry	1.25
San Francisco, Cal.	3.00@3.50
St. Mary's, Pa.	2.25
Thayers, Pa.	2.00
Utica, Ill.	1.00@1.25
Zanesville, Ohio	2.00@2.50
FOUNDRY SAND:	
Albany, N. Y.—Sand blast	4.00
Molding fine and brass molding	2.00
Molding coarse	1.75
Allentown, Pa.—Core and molding fine	1.50@1.75
Arenzville, Ill.—Molding fine	1.40@1.60
Beach City, O. — Core, washed and screened	2.00@2.50
Furnace lining	2.50@3.00
Molding fine and coarse	2.25@2.50
Cheshire, Mass.—Furnace lining, molding, fine and coarse	5.00
Sand blast	5.00@8.00
Stone sawing	6.00
Cleveland, O.—Molding coarse	1.50@2.00
Brass molding	1.50@2.00
Molding fine	1.50@2.25
Core	1.25@1.50
Columbus, Ohio—Core	.40@.75
Sand blast	3.50@5.00
Furnace Lining	1.75
Molding fine	2.00
Molding coarse	1.25@1.75
Stone sawing	1.50
Traction	.75
Brass molding	2.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.60	.60	.60
Ambridge and So. Heights, Pa.	1.15	1.15	1.15	1.15	.70	.70
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		.65		.90	1.00	
Farmingdale, N. J.	.48	.48	1.00	1.00	1.20	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75	1.35		1.25
Machias, N. Y.	.95	.95	1.25	.85	.85	.85
Pittsburgh, Pa.	1.15	1.15	1.15	.70	.70	.70
Portland, Maine		.50	1.75		1.35	1.35
Washington, D. C. (rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.40	.40				.90
Barton, Wis.	.60	.60	.70	.70	.70	.70
Beloit, Wis.		.50			.50	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.65@1.00	.75@1.00	.75@1.00	.75
Des Moines, Ia.	.50	.40	1.50	1.50	1.50	1.50
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.40	40	1.00@1.25	1.00		.90
Elkhart Lake, Wis.	.56	.40	.66	.50	.50	.50
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Greenville, Mechanicsburg, O.	.65	.65	.65	.65	.65	.65
Hamilton, Ohio		.90			.90	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.		.40		.60	.60	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Libertyville, Ill.		.50		.70		
Mankato, Minn.—Pit run	.50	.40			1.25	
Mason City, Ia.	.65	.55	1.70	1.60	1.55	1.55
Mendota, Ill.	.80	.80@ .95		.80@ .95	.70@ .85	
Milwaukee, Wis.	1.06	1.06	1.26	1.26	1.26	
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	.60	.60	1.20@1.40	1.20@1.40	1.20@1.40	1.20@1.40
St. Louis, Mo., f. o. b. cars	1.10	1.30	1.50	1.30	1.25	
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	.75	.75	.75	.85	.75	.75
Waukesha, Wis.	.50		All other sizes, .70 per ton			
Winona, Minn.	.40	.40	1.25	1.10	1.10	1.10
Yorkville, Sheridan, Moronts, Oregon, Ill.	.60	.50@ .70		.60@ .80	.50@ .70	.60
SOUTHERN:						
Alexandria, La.		.70			1.20@1.35	
Birmingham, Ala	1.48		all gravel—1.88			
Charleston, W. Va.		1.40				1.50
Estill Springs, Tenn.	1.35	1.15		1.00	.85	.65
Ft. Worth, Tex.		2.00		2.00		2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75	1.00	1.50	1.50	1.50	1.50
Lake Weir, Fla.		60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.	1.00	1.00				.80
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	1.20	.90	Washed gravel, all sizes, 2.25			
Roseland, La.		.25	.85	.85		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)					
Los Angeles, Calif.		1.00		1.50	1.50	
Pueblo, Colo.	1.10*	.90*			1.50	
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*		1.00*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch	Sand, ¼ inch	Gravel, ½ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Estill Springs, Tenn.						.85
Fishers, N. Y.		.50@ .65		.50@ .65		
Grand Rapids, Mich.						.50
Hamilton, Ohio			.45 per cu. yd. in pit			
Hartford, Conn.		1.00*				
Hersey, Mich.				.50	.50	
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Tex.					.55	.55
Janesville, Wis.		.65			.65@ .75	
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.40			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Tex.		.80		1.50		1.30
Winona, Minn.			Clean pit run .70			
York, Pa.		.95@1.20		(crushed rock sand)		

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.70	1.25	.90	.85	.80	.80
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.			1.25	1.25	1.25	1.25	1.25
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05		Other grades 1.45				
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.92	1.67	1.77	1.77	1.77	1.67	1.67
			(Any delivery in city except team track deliveries)				
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN								
Bellefonte, Pa.			8.00	9.00	8.00	.....	7.00	.....
Berkley, R. I.			12.00				.....	2.30
Buffalo, N. Y.	10.50	9.00	8.50@11.00	11.00	7.25	9.25	8.00	1.50
Chaumont, N. Y.					2.50	4.00	.....	.....
Lime Ridge, Pa.					.....	.....	5.00	.....
West Rutland, Vt.	13.50@14.00	11.00@11.50	11.00@11.50	13.50	10.00	.....	11.00	3.50
West Stockbridge, Mass.					.....	.....	.....	2.25
Williamsport, Pa.			10.00		.....	10.00	6.00	.....
York, Pa. (dealers' prices)		10.50	10.50	11.50	.....	.....	8.50	1.65*
Zylonite, Mass.		3.20d	2.90d	7.00				
CENTRAL:								
Cold Springs, Ohio	10.50	9.00	8.50		7.25	9.25	8.00	.....
Delaware, Ohio		9.50	8.50	10.50			8.00	1.50
Gibsonburg, Ohio	10.50	9.00	8.50		7.25	9.25	8.00	.....
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70*
Luckey, Ohio	10.50	9.00	8.00				8.00	.....
Marblehead, Ohio	10.50	9.00	8.50				8.00	1.50*
Mitchell, Ind.		11.00	11.00	11.00	9.50	.....	8.50	1.45
Sheboygan, Wis.							.....	7.50d
White Rock, Ohio	10.50	9.00	8.50	11.00	7.25	9.25	8.00	1.50
Woodville, O. (dlrs.' price)	10.50	9.00	8.00	10.00	7.25	.....	8.00	1.50
SOUTHERN:								
Erin, Tenn.							6.00	1.00
Karo, Va.							7.00	1.30
Knoxville, Tenn.	22.00	9.50@11.00	9.50	10.50			7.50	1.30
Ocala and Zuber, Fla.	12.50@13.00		12.50	12.00	13.00		12.00	1.60
Sherwood, Tenn	11.00	9.50			7.50	.....	7.50	.....
Staunton, Va.					7.00	8.00	7.50b	1.40
WESTERN:								
Colton, Calif.			15.00				19.70	.....
Kirtland, N. Mex.							12.50	.....
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.15*
Tehachapi, Calif.							13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl. (d) 280-lb. bbl. net.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dresden, O.—Core and traction	1.00
Molding, fine and coarse	1.25
Brass molding	1.50
Dunbar, Pa.—Traction, damp	2.25
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core	1.00
Sand blast	3.25@3.75
Traction	.30@ .50
Falls Creek, Pa.—Molding, fine and coarse	1.75
Sand blast	2.00
Traction	1.75
Franklin, Pa.—Core	1.25@1.75
Furnace lining	2.50
Molding fine	2.00
Molding coarse	1.75
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.10@1.40
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and luting clay	.60@ .80
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and fine, stone sawing (pit run)	1.75
Klondike, Pacific and Gray Summit, Mo.—Molding fine and core	1.75@2.00
Mapleton, Pa.—Core, furnace lining, molding fine and coarse	1.75
Massillon, O.—Traction, molding fine and coarse, furnace lining, core	2.25
Michigan City, Ind.—Core, traction	.40@ .45
Mineral Ridge, Ohio—(Green) core	2.00
Furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding	2.00
Montoursville, Pa.—Core	1.25@1.50
Traction	1.00@1.25
Molding fine	1.50
Molding coarse	1.50@2.00
New Lexington, O.—Molding fine	2.00
Molding coarse	1.75
Oregon, Ill.—Core, furnace lining, roofing sand	1.25@1.75
Sand blast	2.50@3.50
Stone sawing	2.00@3.00
Traction, brass molding	1.25
Ottawa, Ill.—Core, furnace lining, molding fine and coarse (crude silica sand)	.75@1.00
Ottawa, Minn.—All crude silica sand	.75@1.25
Pelzer, S. C.—Glass sand (carload lots only)	.70
Rockwood, Mich.—Core, damp	1.90
Roofing	2.75
Sand blast	3.75

Miscellaneous Sands

(Continued)

Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@3.50
Direct from pit.	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Thayers, Pa.—Core	1.75
Furnace lining	1.00
Molding fine and coarse	1.25
Traction	1.75
Utica, Ill.—Core	1.00
Furnace lining	1.00
Molding fine	.75
Roofing coarse	.90
Stone sawing	1.00@2.50
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.00
Traction, brass molding (dry)	2.00
Zanesville, Ohio—Brass molding and molding fine	1.50@1.75
Molding coarse	1.15@1.40

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Asheville, N. C.—Ground talc (150-200 mesh), 200-lb. bags, per ton	8.00@14.00
Pencils and steel workers' crayons, per gross	1.25@ 2.50
Tailors' chalk, per gross	1.50
Baltimore, Md.—Ground talc (20-50 mesh), bags	10.00
Ground talc (150-200 mesh), bags	14.00
Cubes	50.00
Blanks (per lb.)	.07
Chatsworth, Ga.—Crude talc	7.00
Ground talc (150-200 mesh); bags	10.00@12.00
Pencil and steel workers' crayons	1.25@ 3.00
Chester, Vt.—Ground talc (150-200 mesh), bulk	7.50@ 9.00
Emeryville, N. Y.—200-325 mesh; bags	14.00@16.00
Glendale, Calif.—Ground talc (150-200-mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@ 3.50
Ground talc (20-50 mesh)	5.50@ 7.75
(150-200 mesh) bags	8.25@10.50
Johnson, Vt.—Ground talc (20-50 mesh), bulk 7.50; (150-200 mesh)	8.00@15.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags)	16.00@20.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk 4.00; bags	5.00
(150-200 mesh); bulk 6.00; bags	7.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	7.50
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	9.00@14.00
(Bags 1.50 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton	
Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 65%-70%	4.00@5.50
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L.	7.00
Mt. Pleasant, Tenn.—Analysis, .70 B.P.L. (2000 lbs.)	6.50
Montpelier, Idaho—70% B.P.L.—Crude	4.75
Crushed 2-in. ring and dried	5.00
Paris, Idaho.—2,000 lb. mine run, B.P.L. 70%	4.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x 7 to 12x6	9.60	8.40	8.10	.....
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50.

(Continued from preceding page)

Ground Rock

	Per 2000-lb. Ton
Wales, Tenn.—B.P.L. 70%	7.75
Barton, Fla. — Analysis, 50% to 65% B.P.L.	3.50@6.00
Centerville, Tenn.—B.P.L. 65%	6.00
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morriston, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 70%	7.00

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.00@ 6.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	12.00@16.00	10.00@12.00
Slate granules		7.00@8.00
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	12.00@25.00	12.00@25.00
Lincoln, Neb. — Red, white, gray in bags		30.00
granite; sacks	28.50@30.00	20.00@22.50
Milwaukee, Wis.		30.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsb'g, N. J.—Green stucco dash		9.00@14.00
Piqua, O.—Marble		7.00@ 9.00
Poultney, Vt. — Roofing granules		3.75
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.	12.00	14.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags		
10c extra	5.00	5.00

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	25.00@35.00
Bellows Falls, Vt.	18.00	25.00@35.00
Birmingham, Ala.	13.50	25.00@35.00
Carpenterville, N. J.	15.50	35.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	20.00	33.00
Houston, Tex.		19.50
Lockport, N. Y.	16.00	
Omaha, Neb.	18.00	30.00
Piqua, O.	15.00	25.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	18.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
Rochester, N. Y.	21.00	
St. Paul, Minn.	15.00	30.00@40.00
Salem, Ore.	25.00	35.00@100.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Seattle, Wash.	18.00@22.00	35.00@75.00
Springfield, Ill.	18.00	28.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	13.00@14.50	28.00@65.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	10.00
Boston, Mass.	15.00
Brighton, N. Y.	14.75
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	13.00
Grand Rapids, Mich.	12.50
Lancaster, N. Y.	13.50
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.50
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Rives Junction, Mich.	11.00
Saginaw, Mich.	11.50
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	16.00
Washington, D. C.	13.50
Winnipeg, Can.	17.00@25.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	
	Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	.....
Dallas, Tex.	25.00	.....
Denver, Colo.	30.00	.....
Detroit, Mich.	15.25	13.25
Fort Dodge, Ia.	19.70	17.00
Grand Rapids, Mich.	15.65	.....
Los Angeles, Calif.	30.00	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.99	.....
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	27.00	.....

	Lump per 180-lb. Barrel (net)	
	Finishing	Common
Atlanta, Ga.	2.00	1.50
Baltimore, Md.	.....	12.00†
Boston, Mass.	3.35	3.10
Cincinnati, Ohio	.....	12.25
Chicago, Ill.	.....	1.40
Denver, Colo.	.....	2.95
Detroit, Mich.	11.50†	10.50†
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.70	1.40
New Orleans, La.	.....	1.75
New York, N. Y.	.....	3.69*
St. Louis, Mo.	.....	.70*
San Francisco, Calif.	.....	1.90
Seattle, Wash.	3.25	2.75
Sheboygan, Wis.	.....	10.00

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.61
Cedar Rapids, Iowa	2.48
Cincinnati, Ohio	2.59
Cleveland, Ohio	2.46
Chicago, Ill.	2.20
Dallas, Tex.	2.25
Davenport, Iowa	2.43
Denver, Colo.	2.65
Detroit, Mich.	2.48
Duluth, Minn.	2.14
Indianapolis, Ind.	2.41
Kansas City, Mo.	2.30
Los Angeles, Calif.	3.06
Milwaukee, Wis.	2.22
Minneapolis, Minn.	2.39
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.80
New York, N. Y. (includes bags)	2.40
(10c per bbl. discount in 10 days)	
Peoria, Ill.	2.41
Pittsburgh, Pa.	2.24
Portland, Ore.	3.00
St. Louis, Mo.	2.10
San Francisco, Calif.	2.63
St. Paul, Minn.	2.39
Toledo, Ohio	2.53
Seattle, Wash.	2.90

NOTE—Add 40c per bbl. for bags.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	——Plaster Board—— ⅛x32x36" Weight 1500 lb. Per M Sq. Ft.	Wallboard, ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	.....	6.00	13.00	.....	12.00	.....	.....	.....	14.00	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Gärbutt, N. Y.	.....	.....	6.00	8.00	10.00	12.00	.....	.....	.....	14.00	.....	.....	.....
Grand Rapids, Mich.	3.00	.....	6.00	8.00	10.00	10.00	.....	.....	31.25	21.00	19.38	20.00	30.00
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	12.00	12.50	.....	.....	33.75	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	15.00	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

New Machinery and Equipment

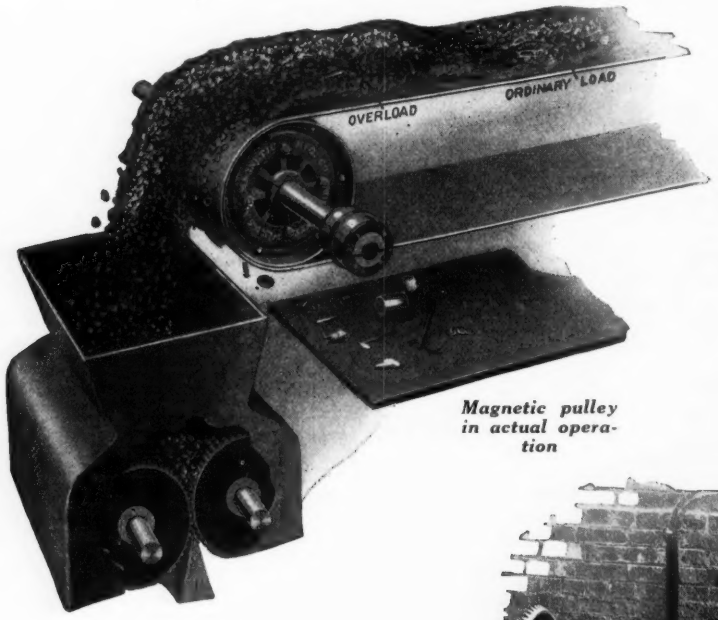
Magnetic Pulleys for Crusher Protection

MAGNETIC pulleys are used for the removal of iron or steel from various sorts of materials, and in crushing, grinding or pulverizing plants they are an absolute necessity to insure the removal of any "tramp iron" that may have entered the material, thus protecting the apparatus against injury.

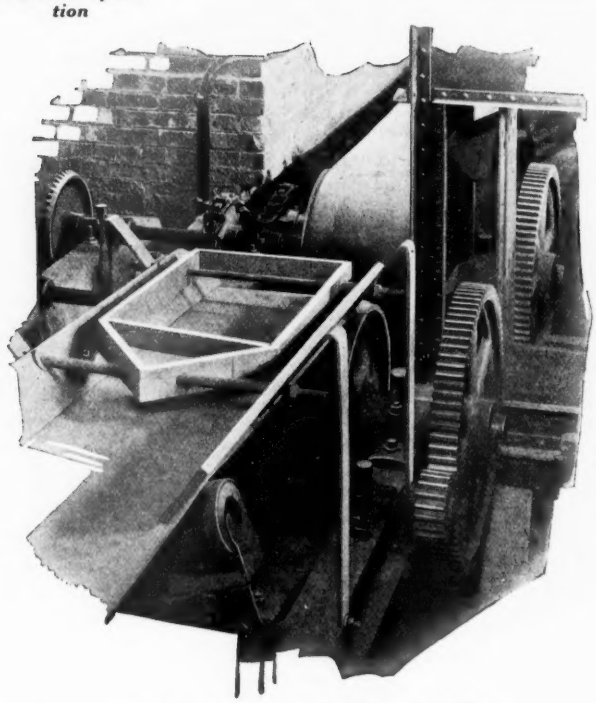
"Tramp iron" enters all materials which are handled on a large scale, either in loading operation or in transportation. Thus in handling stone, sand or coal it is not uncommon to find that it contains stray bolts, rods, nuts, sledge hammers, drill points, etc. This stray iron must be removed before the material enters the crusher or pulverizer if serious accidents and breakdowns are to be prevented.

A magnetic pulley said to meet the conditions described has been perfected and placed on the market by the Magnetic Mfg. Co., Milwaukee, Wis. As shown in one of the illustrations, the operation of "high-duty" magnetic pulleys manufactured by this company is simple. The magnetic pulley is used as the head or driving pulley of a belt conveyor. The material is discharged downwardly as it passes over the magnetic pulley, while any iron contained therein is attracted by the powerful magnetic pull and held firmly against the surface of the conveyor belt and is discharged underneath the pulley as the belt leaves the pulley surface. No breaking of contacts or scraper is necessary to effect this discharge, the iron being gradually carried out of the magnetic field.

The magnet coils of the pulley are wound with heat-resisting magnet wire and the insulation consists of mica and baked enamel.



Magnetic pulley in actual operation



Two high-duty magnetic pulleys 24x20 in.

In addition, these pulleys are ventilated and constructed, it is said, to obtain 2½ times the radiating surface obtainable in pulleys of the enclosed type.

The capacity of magnetic pulleys varies with the diameter of the pulley, the width of the conveyor belt and the speed of the belt. It is important that a magnetic pulley of sufficient capacity be selected since, if this is not done, there is a possibility of a large piece of iron passing the magnetic pulley undetected and shutting down a plant when continuous production is required.

The Magnetic Mfg. Co. have tabulated conservative capacities of some standard, magnetic pulleys manufactured by them. Wherever possible the manufacturers advise that the speed of the belt conveyor should not exceed its recommended belt speed.

New Blast-Hole Drilling Equipment

THE new all-steel blast-drilling equipment of the Armstrong Mfg. Co., Waterloo, Iowa, is, claims this company, built of steel throughout except the band wheel and two sets of the larger bearings. The frame is built of angle steel on a heavy channel steel frame or chassis; there are no bolts—every joint is hot riveted; it is found to be true and rigid even after being subjected to excessive and unusual warping or twisting strain. Being made entirely of steel, this rig is not susceptible to injury if hit by a

chance stone from a blast. The frame is equipped with either electric or gasoline power at the option of the buyer. It has an all-steel derrick fitted with the Armstrong patents covering the use of wire line instead of manila cable. This all-steel rig is so designed and constructed that the speed with which it will penetrate rock formations will mean a big saving in the cost of drilling blast holes.

This machine is built in tractor models only—weighs eight tons and is said to be as easily handled as an ordinary truck or tractor.

Pivoted Bucket System of Handling Materials

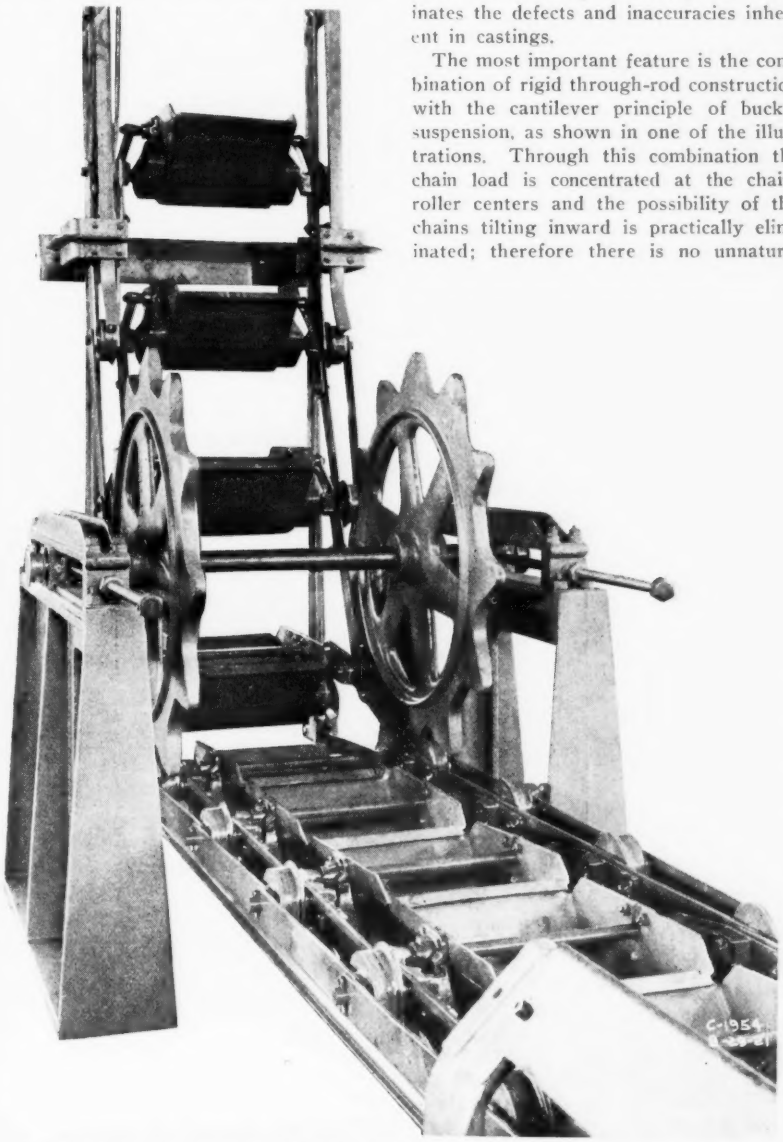
IN cement plants the pivoted bucket system of handling coal, rock, shale, and clinker has long been regarded as most practical and economical. For more than 25 years this bucket has been justifying its existence in delivering material to grinders and bins.

Of the several types of conveyors now in use each has its advantages. In the new pivoted bucket carrier, claims the maker, the Chain Belt Co., Milwaukee, these features are combined, as well as having further refinements of design to give smoother operation and longer life.

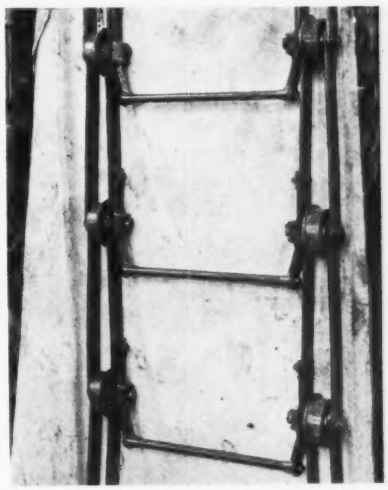
Among the more important features are rigid through-rod bucket supports combined with cantilever suspension, easy removal of bucket and chain parts without disturbing the rest of the equipment, special facilities for lubricating the wearing parts, and a steel chain with case-hardened pins and bushings and white iron rollers; the steel chain eliminates the defects and inaccuracies inherent in castings.

The most important feature is the combination of rigid through-rod construction with the cantilever principle of bucket suspension, as shown in one of the illustrations. Through this combination the chain load is concentrated at the chain-roller centers and the possibility of the chains tilting inward is practically eliminated; therefore there is no unnatural wear on the chains and the carrier operation is smoother. To assure absolute rigidity the through-rod is turned down on each end and hot-riveted to the drop forged steel cantilever side arms. The turned-down ends are sufficiently long to provide rigidity when riveted into place. The centilever arms are assembled to the chain by means of a bolt together with a heavy chain pin, tapered on one end to give it a tight wedge fit in the side arm. This pin also has generous bearing length to prevent all play. A ⅞-in. hexagon nut holds the pin, and a special locking plate gripped by four lugs on the side-arm hub prevents the nut from turning.

The general scheme of construction is shown in the illustrations, where there is seen a loosely suspended carrier with the buckets approximating the positions assumed when moving downward and about to enter the horizontal run; also the freedom with which the buckets nest in the overlapped position. There is no awkward interference, no lap adjusting devices are needed, and the overlapping lip drops into position automatically. The method of tripping the buckets is also shown, illustrating the effective discharging position attained. The bucket is thus held for several seconds to allow sluggish material ample time to discharge.

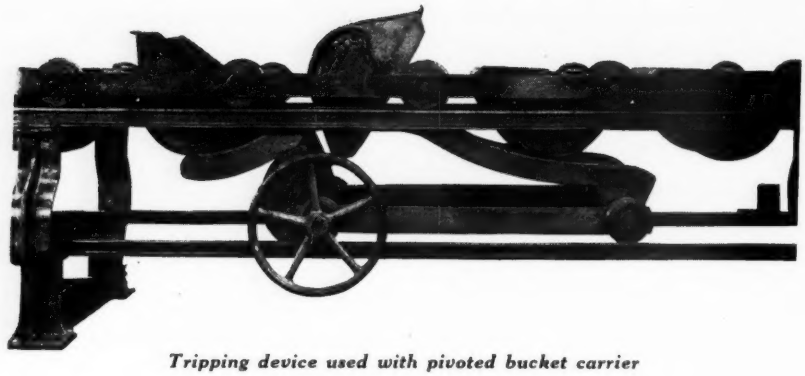


Loosely suspended carrier with buckets about to enter lower horizontal run. The buckets nest themselves in the overlapped position without lap-adjusting device



Method of combining rigid through-rod construction with the cantilever bucket suspension

Although the rigid through-rod cantilever construction eliminates most of the unnatural wear on the chain rollers, normal rubbing wear is also minimized by white iron rollers. Special tool steel is used to bore the chain rollers on this new carrier. As pivoted bucket carriers are usually used with coarse and abrasive materials, the importance of this wear-resisting roller is readily apparent. The cutaway design at the top of the malle-

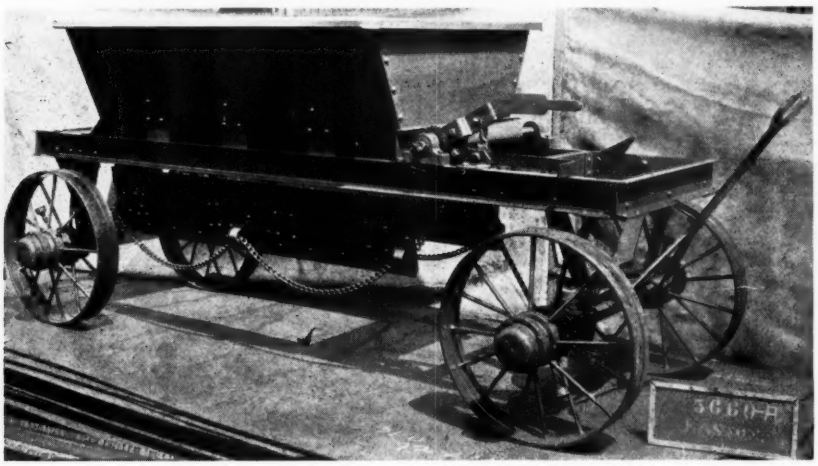


Tripping device used with pivoted bucket carrier

able iron bucket makes it possible to remove the bucket from the through-rod without disassembling the chain.

New Trailer for Handling Material

MOTOR haulage in general contracting work has created a demand for new types of equipment specially designed and built to meet the severe requirements



A bottom dump trailer having 40 cu. ft. capacity

of this service. Among the recent trailer developments are two models built by the Easton Car and Construction Co., Easton, Pa. These vehicles are used in handling sand, stone, and other construction material.

The bottom dump trailer has a capacity of 40 cu. ft., although other sizes are built. The platform type will handle loads of two or three tons.

Both trailers are equipped with 30-in. wheels, with wide steel tires and roller bearing hubs. Couplings are provided for operation, singly or in trains, and the turning radius is short, as the wheels cut under the body. They have ample strength and are clean-cut in design and are built to meet the needs of those having to undertake heavy, fast hauling and who demand the utmost in endurance.

Crawler Tractors for Shovels of Railroad Type

RAILROAD-TYPE shovels of all kinds and sizes may now be equipped with caterpillar-type traction. The Bucyrus Co., South Milwaukee, Wis., makes a mounting of two forward driving crawlers, replacing the jack arm and two rear crawlers mounted under the rear end of the shovel. The front crawlers are so designed that they can swivel and adjust themselves to unevenness of the ground. The speed is ½ mile per hour and the traction power is sufficient to enable the shovel to climb 15 to 20 per cent grades. The rear crawlers consist of two units mounted in the same frame.

Steering is accomplished through the rear crawlers. A massive steering arm, integral with the pintle of the rear trucks, carries a heavy gear segment which engages a pinion on a vertical shaft. It is driven by an independent center valve, reverse-type engine, suspended below the car frame. Steering in curves of large diameter may be accomplished by merely swinging the boom.

Advantages claimed for this mounting are as follows: Time is saved, as only 10 sec. are required for an ordinary move; no rails are to be laid nor jacks to be released and reset. Since the shovel can be moved quickly it does not have to face blasting, and in emergencies, such as slides, can be moved out of danger. It saves two to four pitmen and in soft ground requires blocking only under the crawlers.

Roebling Insurance Plan Protects 6000 Families

IT IS announced by the John A. Roebling's Sons Co., Trenton, N. J., that all employes who have been with the company a year or longer, on September 1, 1922, are now protected by group life insurance and pension plans. The insurance is graded according to length of service, all employes more than one year and less than two years to receive $500, increasing $100 for each additional year until the maximum of $1,500 is reached for 11 years and over. The insurance benefits will be payable to the beneficiary named by the employe or, in the event of his becoming totally and permanently disabled before reaching age 60, it will be paid to him.

The pension plan contemplates retirement at 60 for men and at 55 for women, and in the event of 20 years' service or more, such an employe may request a pension or be retired at the discretion of the company. Any employe, however, who has served 30 years or more, or any male employe 55 years of age or female employe 50 years of age whose term of service is 25 years or more, may at the company discretion be retired and granted a pension.

The plan also provides that pensions may be allowed in cases of total disability arising from nonoccupational injuries and illnesses, provided the employe has served 15 years or more.

The amount is determined by multiplying 1 per cent of the average annual pay during the 10 years preceding retirement by each year of service. A minimum of $25 per month and a maximum of $250 a month has been established and will apply, except where the pension is being paid in cases of total disability above referred to, in which the minimum may be less than $25 per month.

From Dry to Wet Process Cement

H. L. BLOCK, president of the Missouri Portland Cement Co., in a recent letter to ROCK PRODUCTS says that the company has just started work on changing the plant from a dry to wet process. "If we are fortunate, we will have it ready for operation about March 1, 1923," says Mr. Block.

News of All the Industry

Incorporations

The **Millwood White Sand Co.**, Jackson, Ohio, has been incorporated for $120,000.

The **Melcher's Fullers Earth Co.**, San Antonio, Texas, has been incorporated for $100,000.

The **East End Sand and Gravel Co.**, Chillecothe, Ohio, has been incorporated for $25,000 by C. C. Gettles.

The **Titan Cement Co.**, Ackerman, W. Va., has been incorporated for $500,000 by W. L. Sperry, J. W. Cook and D. R. Bartz.

The **Palmer Concrete Products Co.**, Peabody, Mass., has been incorporated for $50,000 by B. C. Eastman, O. Palmer and E. R. Little.

The **Iron Ore Gravel Co.**, has been incorporated in Orange, Tex., for $10,000 by B. N. Akin, L. Fruter and L. Woodworth.

The **High Grade Sand and Gravel Co.**, Denver, Colo., has been incorporated for $100,000 by G. W. Hamilton, H. F. Collins and H. S. Silverstein.

The **Florida Hard Rock Corporation**, Ocala, Fla., has been incorporated for $10,000 by J. L. Wallace, president; J. G. Bowden, secretary and treasurer, and others.

The **Niagara Stone Products Co.**, Bellefontaine, Ohio, has been incorporated for $200,000 by C. W. Hart, D. A. Frampton, W. J. Hyde, I. D. Williams and J. C. Payers.

The **Hull Cement Co, Inc.**, Brockton, Mass., has been incorporated for $10,000. The officers are S. H. Gross, president; Fred Hull, treasurer; and John McCarty.

The **Palmer-La Rue Sand and Gravel Co.**, Chagrin Falls, Ohio, has been incorporated by C. B. Palmer, Leona B. Palmer, N. B. Palmer, C. P. La Rue and Nellie E. La Rue.

The **Tennessee Quarry Co.**, Knoxville, Tenn., incorporated for $10,000, has been organized and petition for a charter has been filed. Incorporators are L. C. Gunter, C. H. Armstrong, W. S. Roberts, C. S. Bryan and A. Y. Burrows.

Beaton Brothers Quarry Co., Inc., with principal office at South Ryegate, Vt., has been incorporated with a capital of $15,000 and will develop and operate granite quarries. Incorporators are J. F. Beaton, A. Beaton and R. M. Beaton, South Ryegate.

Quarries

The **France Stone Co.**, Toledo, Ohio, will operate a stone quarry near Tiffin and will supply trade within trucking distance.

M. T. Kiggens will reopen his rock quarry near Hillsboro, Ill., and will supply ground limestone for farm as well as coarser stone for ballast, etc.

The **Continental Asphalt and Petroleum Co.**, Oklahoma City, Okla., is installing a crusher and rollers near Sulphur, Okla., for working rock asphalt.

The **Cliffdale Quarry & Manufacturing Co.**, Knoxville, Tenn., has been incorporated for $25,000 by T. A. Carron, E. R. Rombauer and M. J. Whyte.

The **Indiana Quarries Co.**, Bedford, Ind., whose mill was recently burned with a loss of $400,000, will rebuild as soon as possible. Nelson Joynor is general superintendent.

The **American Rock Asphalt Co.**, has been incorporated in Valliant, Okla., with a capital of $100,000 by H. C. Clark, Valliant; R. P. Taylor and T. E. Webber, Texarkana, Tex.

The **Silica Products Co.**, Cleveland, Ohio, plans for the immediate opening of its silica sand quarry southeast of Bedford, Ohio. Many good orders have been booked and are in sight, according to E. C. Ritter, head of the company.

Waterloo, Ia.—With the reopening of the old Bartlett & McFarlane stone quarry, and the starting up of two huge rock crushers, a prewartime industry that means much to the prosperity and activity of Waterloo has been revived and will furnish employment for a considerable number of men. The property, which contains an almost inexhaustible supply of high quality limestone, is owned by the Waterloo Stone Co. and is to be operated by Adelbert Bartlett, who has been in the stone quarry business for 25 years. Operations were begun with 20 men. A third crusher is being installed and when in operation the force will be increased to 30 men. The crushers are electrically driven, as is the drill used in boring for blasting of the rocks. A by-product of the crushed rock is dust siftings from the screens, which is sold to farmers for fertilizer and to railroads for ballast. It is planned to keep the quarry in operation both winter and summer.

Cement

C. C. Allen, Nashville, Tenn., is interested in establishing a cement plant.

The **Titan Cement Co.**, Ackerman, W. Va., has been incorporated for $500,000 by W. L. Sperry, D. R. Bartz and J. W. Cook.

The **Peru Stone and Cement Co.**, Peru, Iowa, is offering free limestone f. o. b. the quarries where 8 to 10 farmers wish to get together and order a car.

The **National Portland Cement Co.**, of which A. E. Gorham, Mt. Pleasant, Mich., is president, has begun excavating for its plant.

H. J. Fussner, operating a marble working establishment in Bellingham, Wash., plans the erection of a $20,000 reinforced concrete building.

The **Security Cement and Lime Co.**, Hagerstown, Md., has begun work to enlarge its plant and increase its output 50 per cent. The work is to be completed by next spring.

The **Globe Portland Cement Co.**, 416 McKnight building, Minneapolis, Minn., will erect a cement plant at Dubuque, Ia., with an expenditure of about $2,000,000. The architect and builder is the H. C. Struchen Co., St. Paul.

New Castle, Pa.—Employes of the Lehigh Portland Cement Co., 700 in number, returned to work following the granting of a 20 per cent increase in wages effective September 1. The men have been out on strike since August 14.

The **Egyptian Portland Cement Co.**, Port Huron, Mich., has closed a lease for the former Grand Trunk steel car shops plant and will begin the production of cement in February. The plant has river frontage and the work of bringing stone to the plant by water will begin at once.

The **Monolith Portland Cement Co.**, with main offices at Los Angeles, Calif., is securing additional capital to increase the capacity of its plant by distributing a portion of its stock among the users of cement as well as with the public. During the past year the company reports sales of more than 1,000,000 sacks of cement in its immediate territory. A new kiln for burning lime rock has been ordered. The plant is running 24 hours, with three complete shifts.

Sand and Gravel

The **Central Illinois Sand, Gravel and Coal Co.**, Peoria, Ill., has been dissolved.

The **Service Sand Co.**, near Tulsa, Okla., reports good business for the past season. The plant started operations July 1, and at present believes it would find it hard to handle business that might come if the strike were settled.

Ventura, Calif.—Announcing that it proposes to expend $100,000 on its plant here, the Anaheim Sand and Gravel Co. has concluded a deal with G. Ferro for the leasing of the Ferro properties along the Santa Clara river at Saticoy.

Murfreesboro, Ark.—Mr. Eames, Shreveport, La., is negotiating for a nearby gravel pit and proposes to install washing machinery and other equipment and begin shipment of gravel when tracks can be laid for a loading spur.

The **Triangle Rock and Gravel Co.**, recently incorporated at San Bernardino, Calif., will begin operations as soon as they install the crusher. Officers are N. O. Baker, president; G. Holcomb, secretary; C. B. Hansen, treasurer, and G. Ralphs and J. G. Mitchell.

J. C. Glenn, Tulsa, Okla., is erecting a $25,000 sand plant at West Tulsa on the Arkansas river. The plant will be electrically equipped. A steel boat is being constructed for use in the open stream as the base for a powerful pump which will pump sand and water into a large pit. The plant has storage capacity for 10,000 yd. of sand.

New Orleans, La.—Bids have been called for by U. S. Engineers' office at Customs House for construction of spur dikes at head of the Mississippi river as well as for the construction of spur dikes at Southwest Pass. The improvements and supplies for sand and gravel, cement and stone will approximate $1,000,000. Bids will open September 1 for 8200 cu. yd. of sand and on September 7 for the necessary stone to be used at Southwest Pass, Head of Passes and at South Pass.

Concrete Products

The **Bend Concrete Pipe Co.** will erect a pipe manufacturing plant at Klamath Falls, Ore.

The **Standard Concrete Pipe Co.**, Minneapolis, Minn., is building a factory at 1350 Arthur street, N. E.

The **Concrete Pipe Co.**, Board of Trade building, Portland, Ore., is about to build a factory to cost $30,000 in the Albina district.

The **Yakima Cement Products Co.**, Yakima, Wash., has been incorporated for $30,000 by W. P. Hews and D. V. Marthland.

The **National Concrete Products Co.**, Wilmington, Del., has been incorporated for $500,000 and will manufacture concrete products.

The **Baltimore Concrete Products Co.**, Baltimore, Md., has been incorporated for $150,000 by B. W. Denson, C. Denson and F. T. Kapp.

A. C. Campbell and others propose the erection of a factory in Winnfield, La., for the manufacture of concrete blocks, arched culvert blocks, tile, etc.

The **Strebel Cement Products Corp.**, Queens, N. Y., has been incorporated for $8,000 by E. Strebel and W. Bues. M. Blau, 154 Nassau street is the attorney.

The **Seaboard Spar and Mica Co.**, Asheville, N. C., will install equipment for the manufacture of artificial marble in connection with present concrete products.

A. Albinson, 300 Fifth avenue, S., Minneapolis, Minn., can give information about a new $35,000 corporation which has purchased a site and will erect a concrete block factory in Ironwood, Mich.

The **Keynote Manufacturing Co.**, Indianapolis, Ind., has been incorporated for $10,000 and will manufacture septic tanks and concrete products. Directors are C. M. Mayo, H. E. Kinney and J. L. Clough.

The **Universal Concrete Products Co.**, New Martinsville, W. Va., is considering an Eastern manufactory at Cumberland, Md., according to one of its representatives. The site is now under consideration.

Lime

The **Kittanning Limestone Co.**, has begun the erection of a warehouse in Kittanning, Pa.

The **Keystone Lime Works**, Keystone, Ala., has established a plant in which machinery is being installed for a capacity of 1000 bbl. daily.

The **Security Cement and Lime Co.**, Haterstown, Md., has paid a 3 per cent dividend on its common stock. The dividend was the first ever declared on the common stock.

R. M. Hudges, sales manager of the Fisher Lime and Cement Co., Memphis, Tenn., and Little Rock, Ark., announces that a distributing warehouse will be established at Pine Bluff, Ark.

The **Rushville Lime Co.**, Bremon, Ohio, at a recent meeting elected the following directors: R. Johnson, H. Scholl, B. Seifert, E. Young, B. F.

Scholl, J. Schmetzer and Mr. Groves. The company is considering erecting a lime bin at Bremon.

The Grove City Limestone Co., Grove City, Pa., reports a boom trade in its agricultural limestone products during the past season A total of 125 agencies in Pennsylvania are selling its product. Enough of the product is being shipped to fertilize over 5,000 acres each week.

The Keystone Lime Works, Keystone, Ala., has been organized by W. A. Hammond, Saginaw, Ala., and G. L. Scott, Longview, Ala. The plant will be electrically operated and hydrating machinery and other equipment will be installed. The capacity will be 1000 bbl. of lime per day.

The Tennessee Quarry Co., Knoxville, Tenn., has increased its stock to $10,000. The company has been operating to supply stone for ballast and general building and contracting trades, but since opening up its quarries an analysis revealed stone over 99 per cent pure lime. A large pulverizer has been installed for agricultural lime. Officers are: L. C. Gunter, president; C. H. Armstrong, secretary and treasurer, and S. H. Padgett, superintendent.

Dealers

Gary, Ind.—The Gem Building Material Co. has been incorporated for $9,000 and will deal in cement, lime, plaster and building supplies. Incorporators are H. A. Hawke, S. H. James and M. D. James, Gary.

Manufacturers

The Traylor Engineering and Manufacturing Co., Allentown, Pa., has changed the location of its northwestern district office, of which W. H. Agens is manager, from 616 Mohawk building, Spokane, to 815 Alaska building, Seattle, Wash.

The Ashburn Works of E. I. Du Pont de Nemours & Co., near Hannibal, Mo., will resume the manufacture of high explosives early in September. This plant was closed down about a year ago when the slump in business conditions caused a falling off in the consumption of dynamite. During the time of the shut-down, the trade logical to the plant was supplied from other operating works. The improvement in business conditions, resulting in increased demands for high explosives, makes it necessary to resume operations. The Ashburn plant has a capacity of about 15,000,000 lbs. of high explosives per year.

The du Pont Co., Wilmington, Del., announces that its smokeless powder division will be separated from the explosives department and will be operated independently as the smokeless powder department, under the guidance of Vice-President A. Felix du Pont, general manager. Mr. du Pont has been the assistant general manager in charge of the smokeless powder division since September, 1921. Since he entered the service of the company in August, 1903, most of his time has been devoted to work in smokeless powder. He was superintendent of the Carney's Point plant for five years and later assistant superintendent of the smokeless powder operating department, continuing his connection with this branch of the work all through the war years. He was a director of the old du Pont company and was elected a director of the present company on September 8, 1915; a member of the executive committee in April, 1919, and a vice-president in charge of the cellulose products manufacturing department the same month. He resigned as a member of the executive committee a year ago to assume his present position with the smokeless powder division.

Potash

The Diamond Match Co.'s potash plant at Barberton, Ohio, was totally destroyed following an explosion at the plant. The damage is estimated at $200,000.

Phosphate Rock

The Southern Phosphate Corp., have announced the removal of their New York office from 96 Wall street to Broad Exchange building 25 Broad street. The change was made in order to secure additional room and take care of the increasing business of the company.

Gypsum

The Federal Gypsum Products Co., Wilmington, Del., has been incorporated for $200,000.

The Gypsum Engineering and Manufacturing Co., 111 West Washington street, Chicago, will manufacture and deal in gypsum and magnesite, by-products, etc. Incorporators are R. I. Rheinstrom, W. L. King and S. Gusdorf. Correspondent is Hamil and Wormser, 105 West Monroe street.

The Acme Cement Plaster Co., St. Louis, Mo., has purchased the mineral rights to 900 acres of land and 15 additional acres have been purchased near Centerville, Ia. A shaft will be sunk immediately. The company has found gypsum of superior quality there and if complete investigation bears out earlier findings it will erect a plant to supplement its Fort Dodge mines.

Personal

J. H. Adams has been elected president of the O'Neil Lime Works, Inc., Birmingham, Ala., succeeding Dr. W. C. Gewin, who resigned that position. The company plans to consolidate with other lime plants in Alabama, Tennessee and Georgia, with headquarters in Birmingham.

William A. Ernst, formerly chief chemist for the National Cement Co.'s plant at Ragland, Ala., has resigned to accept a position with the Gulf States Portland Cement Co., Demopolis, Ala. Mr. Ernst was for many years connected with the plant at Ragland, from the time the plant was known as the Atlantic and Gulf and afterward as the Coosa Portland Cement Co. He was retained by the present owner, the National Cement Co., when it decided to purchase the plant. In his new position he will have full charge of the chemical department of the Gulf States Portland Cement Co.

Regional Requirements of Coal

The problem of transporting coal supplies from Kentucky and the Virginias up the Great Lakes before the suspension of navigation is being given serious attention by the Federal Fuel Committee at Washington, says an *Iron Age* correspondent. A tentative figure of 250,000 tons per week has been agreed upon for immediate movement, but this figure may be changed at any time as the situation may be reflected in the daily figures on coal production and movement. Members of the Michigan State fuel committee have been in conference with Fuel Distributor Spencer regarding the acute fuel situation in that state.

An estimate of 765,000 tons of bituminous coal weekly are being required to meet the immediate needs of gas and electric public utilities and domestic consumers in the territory east of the Mississippi river is made by the United States Geological Survey. Of this amount, New England would require 9.2 per cent; the non-coal-producing states of the coast region exclusive of New England, 21.6 per cent; coal-producing states of the coast region, 22.9 per cent; and Ohio, Indiana, Illinois and Michigan 46.3 per cent. Railroads in the same territory will require 2,000,000 tons weekly, making a total emergency requirement of 2,765,000 tons. Coal is now being produced in this territory at the rate of 3,800,000 tons weekly.

The railway mechanical situation on coal-carrying lines in the Virginias, which has been hampering the shipment of coal, continues to improve with the importation of mechanics from eastern and western lines. The requirements of the Chesapeake & Ohio and the Norfolk & Western systems are said to have been practically met, and mechanics are now being diverted to the Virginian Railway. Shipments of coal from southeastern Kentucky are being retarded to some extent by conditions at Corbin, Ky., where more than 300 railway mechanical employes are said to have left their employment because of threats of violence. An unusual situation prevails in the western Kentucky field, where coal production is accelerated by the existence of a 100 per cent car supply.

Sand—What Is It?

UNDER the legend, "The Making of Definitions," the *Engineering-News-Record* has this to say as to the torturing of a lot of words into defining what another word means:

"As an instance there is recalled the recent deliberations of a committee on the definition of so simple a material as sand. After much discussion there was evolved the definition that sand "is the loose granular product resulting from the natural disintegration or mechanical reduction of rock," which seemed to take care of the appearance, composition and source and to cover the various interpretations of sand in the different arts.

Outside experts called in immediately began to raise questions. What is a grain? What is rock? Is it crushed slag sand? Under this definition, purposely written so as to include the mechanically reduced product known as sand in foundry practice, would not a concrete engineer be required to specify "natural" sand if he had objections to the use of crusher reduced rock as sand? Thus it appeared that sand is not easy to define but that at the same time its exact meaning might well become a matter of the greatest importance."

No-Accident Month for Dixie Cement Co.

A SUCCESSFUL no-accident month campaign was put across by the Dixie Portland Cement Co., Richard City, Tenn., in March.

The results for the first two weeks were not a single accident, and then the company doctor was given two weeks' leave of absence to do post-graduate work in Chicago hospitals. And for the rest of the month no case requiring his attention arose.

Special credit for the success of this campaign is given to the superintendent, W. H. Klein, and to Secretary Uhlman of the Dixie safety committee.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion

FOR SALE

2 8x110′ Rotary Kilns
6 5x6x7x110′ Rotary Kilns
8 5x21′ Tube Mills, Steel Lining
6 250 H.P. Oil City Water Tube Boilers
1 4′ 6″ x 40′ Coal Dryer
1 5′ x 46′ 6″ Rock Dryer
1 No. 5 Gates Crusher
8 Krupp Ball Mills
4 Engines, 200 to 500 H.P.
8 33″ Fuller Mills

Shafting, Pulleys, Bearings and Elevator Equipment, all in first-class operating condition.

50 Acres of Land and Five Buildings, Stone and Steel Construction.
Located at Stockertown, Pa.

ENGINEERING SALES COMPANY, Nashville, Tenn.
OLLIE LAWRENCE, Stockertown, Pa.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½ x25′, 4x30′, 5½x50′, 6x60′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 4x40′, 5x50′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 5x4′, 3x3½′ pebble and ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 12x26″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24″, 36″ and 40″ cage mills; 3′ and 4½′, 6′ and 8′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens; Richardson automatic scales; 8′ and 10′ Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

CRUSHING PLANT FOR SALE

1—No. 5 Austin Gyratory Crusher.
1—No. 5 Austin Standard Elevator.
1—32″ Austin Screen.
1—24″x24″ Austin Belt Hoist.
1—10x12, 200′ capacity Sullivan Air Compressor.

T. G. DAVIS
Transportation Building Chicago, Ill.

1—59-ton standard gauge Baldwin 6-wheel saddle tank switcher.
1—40-ton American 4-wheel saddle tank switcher.
2—50-ton standard gauge Brooks 6-wheel switchers.
1—42-ton standard gauge Shay geared locomotive.
2—18-ton 36″ gauge 4-wheel saddle tanks.
2—23-ton new 36″ gauge Porter 6-wheelers, with tenders.
1—20-ton Industrial Loco. Crane.
1—14-B Bucyrus steam shovel, mounted on traction wheels.

BIRMINGHAM RAIL & LOCOMOTIVE CO.
Birmingham, Ala.

IMMEDIATE DELIVERY

SEND US YOUR STEAM SHOVEL INQUIRIES
65x86 in. TRAYLOR JAW CRUSHER.
No. 18K GATES CRUSHER.
50-75 HP. Single Drum Hoists, 25 Cy. Motors.
40-50 HP. D.D. Hoists, 60 Cy., 220-440 V., 3 Ph.
Nos. 3-5-6-7½ & 8K CRUSHERS.
6 and 12 ton Gasoline Locomotives.
10x12 in. Steam Hoist, 3 Drum.
2—DISC CRUSHERS, 36″ SYMONS.
100 TON 2½ YD. ELEC. SHOVEL.
50 to 5000 ft. Steam, Belt & Elec. Compressors.
JAW and ROLL CRUSHERS.
10-15 & 20 Ton Locomotive Cranes.
13x30 in., 9x14 in. and Other Jaw Crushers.
24x54 McLANAHAN ROLL CRUSHER.

Send us your inquiries for Steam Engine, Centrifugal Pumps, Quarry & Cont. Equip., Etc.

ROSS POWER EQUIP. CO., Indianapolis, Ind.

Have you a plant for sale? Do you wish to purchase a plant? Are you in need of a superintendent or manager? Are you looking for a position as plant superintendent or manager? Advertise your wants in these columns for quick results.

FOR SALE

No. 2 Allis-Chalmers Gates Gyratory Crusher.
No. 3 Austin Gyratory Crusher.
No. 6 Austin Gyratory Crusher.
Two American Process type 24x48″ Rotary Dryers.
50′ continuous steel bucket (8″x16″) and chain elevator.
50′ continuous bucket (7″x13″) and belt elevator.
25 H.P. simple side crank Heilman steam engine.
125 H.P. 18″x24″ side crank Atlas steam engine.
75 H.P. 13″x16″ side crank Erie City steam engine.
Lidgerwood Standard double cylinder, two drum, 10″x12″ hoisting or cableway engine.
Two 150 H.P. General Electric Co. Induction motors, voltage 440 or 220, shop numbers 625140 and 1164925.
Williams No. 9 Swing hammer, Universal type pulverizer.
Worthington 10″ intake by 8″ discharge by 20 cylinders steam pump.
25 tons of 40 to 60 lb. rails.
7—2 yard, all steel, 48″ gauge end dump quarry cars.
One Sanderson cyclone No. 14 electric, non-traction well drill and equipment.

ADDRESS
E. W. Cooper, Engineer
174 3rd Ave. No., Nashville, Tenn.

FOR SALE
Equipment in Excellent Condition

1—Marion 45 ton Steam Shovel, Railroad Type.
4—Steel Ore Dump Cars, Standard Gauge, 100,000 lbs. capacity.
2—Wooden Ore Dump Cars, Standard Gauge, 80,000 lbs. capacity.

These Standard Gauge Dump Cars are ready for main line service. An advantage during present car shortage.

Having installed a hydraulic dredge, we have no further use for this equipment

INTERSTATE SAND & GRAVEL CO.
123 West Madison St., Chicago

FOR SALE

Jaw Crushers:
1—Sturtevant, 6″x15″.
1—Farrell, 9″x15″.
Traylor Roll Crushers:
1—42″x14″ and 1—32″x10″.
Sturtevant Rotary Fine Crushers, Nos. 1, 1½ and 2.
Sturtevant Ring Roll Mill, No. 2.
Belt Conveyor, 18″ wide x 70′ centers.
Lehigh-Fuller Mill, 33″.
Wood Drill with Tripod, 1¼″ steel.
Steel Tank and 75 ft. Tower, 30,000 gal.
Wood Loading Bin, about 20′x60′.

HULBERT A. BOND
Rowayton Connecticut

FOR SALE

One (1) No. 6 McCully Crusher rebuilt by us—price $4000.00, with two (2) extra Master Wheels and one extra Shaft and Head. Subject to inspection in our shop and to prior sale.

R. S. NEWBOLD & SON CO.
Norristown, Pa.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

WANTED

One yard drag line cable-way bucket. State price and condition. A 12-in. bucket elevator for sale; nearly new.

Prairie Sand & Gravel Co.
Prairie du Chien, Wisconsin

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1½ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—⅝ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

WANTED

One four-gang Fairbanks Morse Briquette mould; also a percentage scale and a 1000-lb. capacity cement testing machine. Must be in good condition and reasonable.

Address 515 Montana Building
Lewistown, Montana

FOR RENT AND SALE

20—12-yd. Western air dump cars, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader, used sixty days.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, built 1920.
1—Marion 76 steam shovel, No. 3503, std. gauge, weight 110 tons, used 10 months.
2—Foote 40-8 1-yd. side discharge concrete mixers, with steam engine and boiler.
32—NEW 20-in. I-beams, 80 lbs. per foot, 40 ft. long, not drilled.
1—NEW Lakewood concrete chuting system.
6—NEW wood-burning locomotive-stacks.

Locomotives

1—50-ton 18x24-in. six-wheel switcher.
1—40-ton 17x24-in. four-wheel switcher.
2—NEW 24-ton six-wheel Porters, separate tender, 36-in. gauge.
2—18, 14 and 10-ton Vulcans, 36-in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

WANTED

One 11x16 saddle tank, 36" gauge, used Porter locomotive, for immediate delivery. Must be in good condition, and subject to inspection.

BLAIR LIMESTONE COMPANY
Martinsburg, W. Va.

WANTED TO BUY

Up to fifty 24" gauge dump cars suitable for hand loading in rock quarry, also 24" gauge gasoline locomotive. Give full description as to condition, price and terms. Address

BUCKEYE STONE COMPANY
411 Cotton Exchange Bldg., Houston, Texas

FOR SALE

24" Symons Disc Crusher, never been used.

Breen Stone & Marble Co.
Kasota, Minnesota

Classified Advertising

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

OPPORTUNITY

For sale or for development, a very convenient and valuable stone quarry site of 320 acres located 4 miles east of Trout Lake, Mich., on the Soo and Minneapolis R. R. This is a dolomitic stone accepted by the State Highway Dep't as a No. 1 water bound macadam. It is also a good building stone, taking a marble-like finish. Because of extensive road work in this vicinity, there is a great demand for road stone. A profitable investment for the right party.

L. O. Paquin, Trout Lake, Mich.

Idle Machinery Absorbs Profits

This department is the medium for the men who keep the wheels going. Sell your idle machinery to the man who will keep it going.

WANTED

Granite quarry superintendent for block cutting and stone crushing plant. Steady position for good man. State experience and when available.

Address
Box 1584, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

FOR SALE

600 acres of Silica Sand—Sand used for past 25 years by best foundries and steel plants in U. S. and Canada. Plant equipped with Sauerman Bros. Dragline, etc. For particulars address

H. H. McKEE & SONS
Box 254 Rome, N. Y.

SALESMAN

wanted, with ability, by Company manufacturing Limestone Products. Address

Box 1585, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

George Borrowman, Ph.D.
CHEMIST

Analyses, consultations, researches in connection with rock products, cements, clays, lime, plasters, zeolites, sands, etc.

9 So. Clinton St. Chicago, Ill.

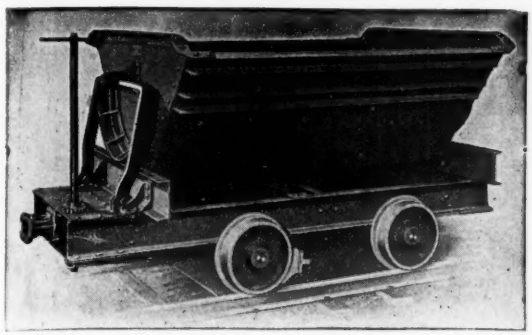
H. E. WIEDEMANN
(Est. 1905)
Consulting and Analytical Chemist

Specialist in Analysis of Rock Products
Chemical Bldg. St. Louis

SUPERINTENDENT

with twenty years' experience in construction and operation of large crushing plants. Quarry operation using steam shovels and modern equipment, also cement mill and pulverizing experience. Good references. Address

Box 1583, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

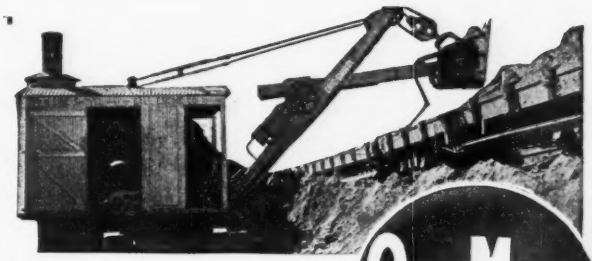


More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.
ENGINEERS MANUFACTURERS
CLEVELAND, OHIO, U. S. A.



One Man; 350 Tons

When you require an output of 800 to 1,000 tons of sand or gravel per day, a fireman is needed in addition to the steam shovel operator. But when you are getting out 350 tons a day, or less, one man can often both operate and fire an ERIE Shovel. The Cumberland Sand Co., of Cumberland, Md., write us:

"Our labor cost is only a trifle; one man operates and fires our ERIE and keeps it in repair. The saving of labor means more efficiency, and our output has increased considerably. To any prospective purchaser, we recommend the ERIE."—A. K. Smith, Manager.

Every ERIE Shovel easily and quickly changed over to Locomotive Crane to handle clamshell bucket.

The ERIE is very strongly built; gives steady service in hard work. Its output compares VERY FAVORABLY with that of larger and more costly shovels.

We will be glad to send you a bulletin showing just what the ERIE Shovel can do. Write for Bulletin P-16.

Erie Steam Shovel Co., Erie, Pa., U. S. A.
Builders of ERIE Steam Shovels and Locomotive Cranes

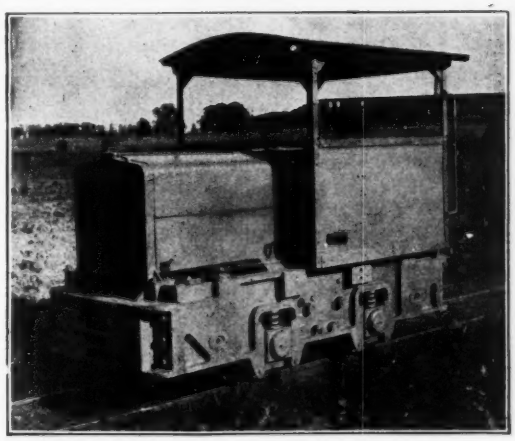
ERIE Revolving Shovels

The Garner Brick Works, located at Haverstraw, New York, with this Minster Six-Ton are hauling their clay about a mile and are turning out 135,000 brick per 8-hour day. Consider this efficiency and adaptability and the economical advantages of the MINSTER over your present method and write for Catalog and information.

The Industrial Equipment Company
310-316 Ohio Street, Minster, Ohio

Eastern and Export Department
The Herbert Crapster Co., Inc., 1 Madison Ave., New York

WHITCOMB LOCOMOTIVES



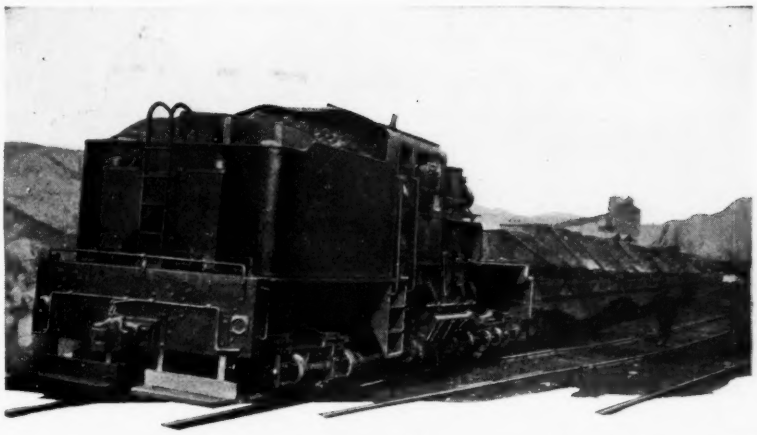
QUARRIES—CEMENT PLANTS—BRICK PLANTS

The success of Whitcomb locomotives in hundreds of plants speaks of their thoroughness of design and construction and dependability in time of need. We would be glad to tell you what they are doing for others.

Whitcomb locomotives are designed to work and built to overwork

WRITE TODAY FOR BULLETINS

GEO. D. WHITCOMB COMPANY
Rochelle, Ill., U. S. A.



Don't impair the operating efficiency of your Shays by using inferior repair parts. Order your parts direct from Lima.

Get a Duplicate of the Old Part

WHEN you need a repair part or a spare part for a Shay Geared Locomotive, get it from Lima.

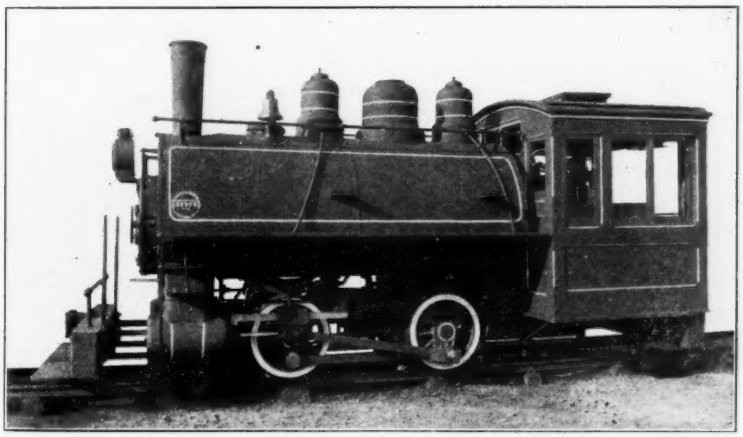
Write or wire to our Repair Parts Department and we'll ship the required part from stock, without a day's delay. We have a large reserve of spare parts for all sizes of standard Shays.

Always give the shop number of your Shay. This number appears on the nameplate on the side of the smokebox.

LIMA LOCOMOTIVE WORKS, Incorporated

17 East 42nd Street, New York Lima, Ohio

BALDWIN INDUSTRIAL LOCOMOTIVES



Light Design

Gauge, 3′ 0″
Cylinders, 10″x16″
Drivers, diameter, 29″
Tank capacity, 700 gals.
Total weight, 37,000 lbs.

These four-coupled tank locomotives are constructed to withstand rough service, and give excellent satisfaction to Road-building Companies and those who supply Road-building materials.

Prices and specifications upon request

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AIR COMPRESSORS
Bury Compressor Co., Erie, Pa.

AUTOMATIC WEIGHERS
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
Jaite Co., The, Jaite, Ohio.

BARREL MAKING MACHINERY
Stoll Co., The D. H., Buffalo, N. Y.

BINS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Neff & Fry, Camden, Ohio (concrete stone).
Weller Mfg. Co., Chicago, Ill. (storage).

BIN GATES
Allis-Calmers Mfg. Co., Milwaukee, Wis.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Du Pont de Nemours & Co., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

BOILERS, WASTE HEAT
Edge Moor Iron Co., Edge Moor, Del.
Freeman Mfg. Co., Racine, Wis.

BUCKETS—Elevator
Brown Hoisting Machinery Co., Cleveland, Ohio.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

BUCKETS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Haiss Mfg. Co., The Geo., New York City, N. Y.
McMyler Interstate Co., Cleveland, Ohio.

CABLEWAYS
Flory Mfg. Co., S., Bangor, Pa.
Interstate Equip Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Construction Co., Easton, Pa.
Watt Mining Car Wheel Co., Barnesville, Ohio.

CAR PULLERS
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.

CLUTCHES
Webster Mfg. Co., Chicago, Ill.

CONVEYORS AND ELEVATORS
Haiss Mfg. Co., The Geo., New York City, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.

CRANES—Locomotive Gantry
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Link-Belt Co., Chicago, Ill.
McMyler-Interstate Co., Cleveland, Ohio.
Northwest Engineering Co., Green Bay, Wis.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago, Ill.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Munson Mill Machinery Co., Utica, N. Y.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.

CLUTCHES
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

DERRICKS
Mundy Hoisting Engine Co., J. S., Newark, N. J.
Terry Mfg. Co., New York, N. Y.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.

DREDGING MACHINERY
Flory Mfg. Co., S., Bangor, Pa.

DRILLS
Loomis Machine Co., Tiffin, Ohio.
Sanderson Cyclone Drill Co., Orrville, Ohio.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DYNAMITE
Du Pont de Nemours & Co., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Buckbee Co., J. C., Chicago, Ill.
Crow, Waller, Inc., Chicago, Ill.
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Hunt, R. W., & Co., Chicago, Ill.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Bay City Dredge Works, Bay City, Mich.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Northwest Eng. Co., Green Bay, Wis.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Northwest Engineering Co., Green Bay, Wis.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Du Pont de Nemours & Co., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.

GEARS
Cleveland Worm & Gear Co. Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Plamondon Mfg. Co., Chicago, Ill.

(Continued on page 76)

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

(Continued from page 74)

GENERATORS
Burke Electric Co., Erie, Pa.

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

HOISTS
Flory Mfg. Co., S., Bangor, Pa.
Link-Belt Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

LIME HANDLING EQUIPMENT
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Industrial Equip. Co., Minster, Ohio.
Lima Locomotive Works, New York, N. Y.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MAGNETIC PULLEYS
Magnetic Mfg. Co., Milwaukee, Wis.

MOTOR TRUCKS
Traylor Eng. & Mfg. Co., Allentown, Pa.

PAINT AND COATINGS
Williams, C. K., & Co., Eaton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

PORTABLE CONVEYORS
Haiss Mfg. Co., The Geo., New York City, N. Y.
Link-Belt Co., Chicago, Ill.

POWDER
Du Pont de Nemours & Co., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

POWER TRANSMITTING MACHINERY
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PULLEYS
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

PULVERIZED FUEL EQUIPMENT
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

QUARRY EQUIPMENT
Universal Road Mach. Co., Kingston, N. Y.

ROAD MACHINERY
Austin-Western Road Mach. Co., Chicago, Ill.

ROPE, WIRE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

SCALES
Richardson Scale Co., Passaic, N. J.

SCRAPERS, DRAG
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Chicago Perf. Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Haiss Mfg. Co., The Geo., New York City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.
Magnetic Mfg. Co., Milwaukee, Wis.

SHEAVES
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SHOVELS—Steam, Electric and Gas
Bay City Dredge Works, Bay City, Mich.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Northwest Eng. Co., Green Bay, Wis.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SPROCKETS
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SPROCKET CHAIN
Webster Mfg. Co., Chicago, Ill.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co., Carbondale, Pa.

STORAGE BINS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Neff & Fry, Camden, Ohio.

STUCCO FACINGS
Metro-Nite Co., Milwaukee, Wis.

SWITCHES AND FROGS
Central Frog & Switch Co., Cincinnati, Ohio.

TANKS, STEEL STORAGE
Traylor Eng. & Mfg. Co., Allentown, Pa.

TESTING SIEVES AND TESTING SIEVE SHAKERS
Tyler Co., The W. S., Cleveland, Ohio.

TRAMWAYS
Interstate Equip. Co., New York, N. Y.

TRANSMISSION MACHINERY
Link-Belt Co., Chicago, Ill.
Plamondon Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

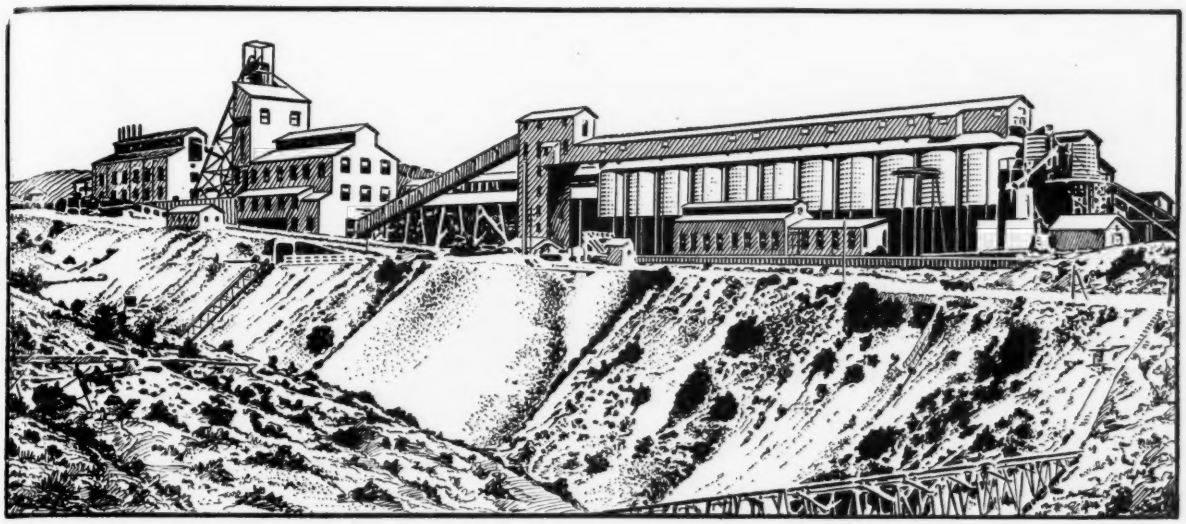
WASHERS, SAND AND GRAVEL
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

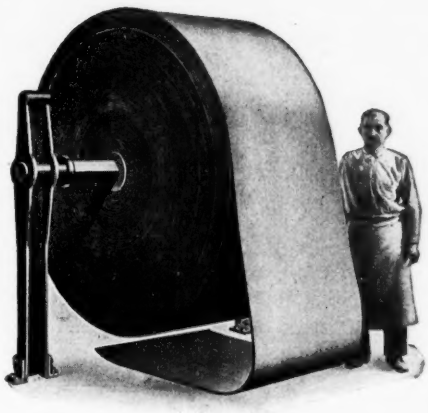
WEIGHING EQUIPMENT
Richardson Scale Co., Passaic, N. J.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
Tyler Co., The W. S., Cleveland, Ohio.

INDEX TO ADVERTISEMENTS





Conveying 9,357,000 Tons of Ore With One Belt

Read This Remarkable Record Made at Miami Copper Company's Mine

Seven years' service from this conveyor belt is the record run made at Miami, a period of usefulness extending through the rush of war production.

The belt cost for conveying this huge quantity of ore is 66/1000 of a cent per ton, truly a remarkable figure for any service.

Width of belt, 30 inches.
Number of plies, 6.
Thickness of cover:
Conveyor side, ⅛ inch.
Pulley side, 1/32 inch.
Date installed, March 11, 1911.
Date taken off, June 1, 1918.

This belt was installed in two sections. The inclined belt, operating at an angle of 3½ inches in 12 inches is 530 feet in length, and the horizontal belt which distributes ore to the bins is 680 feet long.

This installation is an example of a conveyor belt designed by our belt men after careful investigation of all the operating conditions.

These facts determine the character of the rubber compounds used, the kind and weight of duck, and the correct number of plies.

The result is a belt of wear-defying construction that comes through the test of heavy work with cost figures well on the credit side.

Before you buy another conveyor belt, send us the particulars regarding your requirements and we will gladly make recommendations for a suitable belt and submit costs.

NEW YORK BELTING & PACKING CO.

New York
Boston
Chicago
El Paso
Philadelphia
Pittsburgh
St. Louis
Salt Lake City
San Francisco

CONVEYOR BELTING FOR HEAVY MINING SERVICE